community review draft

# napa countywide community climate action framework

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# Executive Summary

## *Our community, our future: the challenge of climate change*

Climate change is a major challenge for the 21st century. Scientific evidence increasingly shows that climate protection targets considered bold even a few years ago may now be inadequate: climate change is happening faster and on a broader scale than the world's scientists predicted just two years ago. Millions of people may experience the effects of climate change on public health, national and local economies, sea level rise and changing food, water and energy supplies.

No action—business as usual—is not an option under current State law. Although the regulatory environment is changing rapidly, it is likely that actions will be required by State Law at all levels of government.

This Community Climate Action Framework provides a consensus-based context for further more detailed planning efforts. It outlines a package of 53 actions that, when translated into locally specific programs and projects countywide, *will* help meet climate protection targets. This Policy Framework will be followed by locally appropriate implementation plans, designed for each jurisdiction, focusing on specific programs and projects.

Transforming our energy infrastructure from fossil fuels to renewables, using less energy overall, and generating less waste and fewer emissions will require a unity of purpose, innovation and commitment.

This Framework is based on a sound analytic process, uses internationally accepted greenhouse gas emissions (GHG) modeling, incorporates input from each of Napa's Cities, Town and the County, and is geared for swift implementation. Every action included met four criteria:

1. It is under local control
2. It will result in significant GHG emission reductions
3. It is cost-effective
4. It is politically feasible

Actions proposed in the Framework will pay for themselves in energy cost and other savings and are designed to promote an economy powered by more local, reliable energy; a healthier environment; healthier people; and a preserved natural environment. Attention has been given to the financial implications of the proposed actions, recognizing the significant fiscal challenges facing California communities today. This Framework has been developed to assist stakeholders in moving from planning to action, which will require the combined effort of residents, businesses, local government staff and elected officials in Napa County. These efforts will work along with vigorous actions, based on new and aggressive state legislation, being planned and underway statewide and in the Bay Area region. Communities across California are now assessing the impact of local emissions and creating similar action plans and frameworks to address this urgent issue. The Napa County Community Climate Action Framework recognizes our connection to the larger community and our responsibility to our constituents.

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## Background

The principle underlying GHG emission reduction targets—and climate protection in general—is meeting the goal dictated by current scientific evidence to ensure that human societies remain in balance with the abilities of natural systems to sustain them. The amount of carbon dioxide in the atmosphere is the best single indicator of the climate crisis—the higher the concentration of carbon dioxide, the more dire the climate crisis. The concentration is now 390 parts per million and must return to 350, according to leading scientists.

Prior to 2005, California communities had a harder task setting GHG emission reduction targets than they do now. In 2005 Governor Schwarzenegger established GHG emission reduction targets for the state. In 2006 the Governor reinforced the 1990 level by 2020 target by signing into law AB 32, the Global Warming Solutions Act.

GHG emissions inventories for Napa cities and the County, completed in March 2009 in cooperation with ICLEI staff, used 2005 as the baseline year. Also shown are 2020 emissions projections if we do nothing and simply continue business as usual. The next column in the table shows the amount of emissions Napa cities and the County need to reduce from projected "do nothing" levels to meet a 2020 GHG emissions target that matches the target established by the State. The last column gives the percentage reduction required to meet AB 32 goals: a 30% countywide reduction.

**GHG Emissions: 30% Reduction Countywide**

| | 2005 Baseline | 1990 Level (metric tons) | 2020 "Do Nothing" forecast | Reduction Needed (tons) | % Reduction Needed |
|---|---|---|---|---|---|
| A. Canyon | 91,449 | 77,732 | 152,393 | 74,662 | 49% |
| Calistoga | 28,427 | 24,163 | 31,480 | 7,317 | 23% |
| City of Napa | 455,062 | 386,803 | 544,572 | 157,769 | 29% |
| St. Helena | 46,052 | 39,144 | 49,541 | 10,397 | 21% |
| Yountville | 28,305 | 24,059 | 31,924 | 7,865 | 25% |
| Unincorporated | 550,986 | 468,338 | 656,989 | 188,651 | 29% |
| **Total** | **1,200,281** | **1,020,239** | **1,466,900** | **446,661** | **30%** |

*Note that the relatively high % reduction indicated for American Canyon is based on projected increases in GHG emissions due to increased traffic **through** the city as well as increased growththat balances reduced growth elsewhere in the County and the region. Specific local reduction goals, not mandated by state regulation, will be addressed by State and Regional regulations and plans being developed now.*

Climate change is primarily a global problem influenced by an array of interrelated factors, many of which are beyond the control of local communities. Climate change is also a local problem with serious local effects foreseen for the cities and County of Napa. Local communities can also make changes that will contribute to the necessary global reduction of GHGs. Some of the possible local effects of climate change are described below.

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**Sea Level Rise:** According to the San Francisco Bay Conservation and Development Commission (BCDC), the sea level in the Bay Area is expected to rise up to 55 inches during the next hundred years. BCDC's models illustrate that portions of Napa County, particularly along the Napa River, may be subject to increased flooding with just 16 inches of sea level rise.

**Agriculture**: Climate change is projected to have significant impacts on conditions affecting agriculture, including temperature, carbon dioxide, snow pack run-off, precipitation and the interaction of these elements.

**Native Plants and Wildlife:** Napa County is home to a particularly diverse population of plants. Native plants and animals are also at risk as temperatures rise.

**Water**: With warmer average temperatures, more winter precipitation will fall in the form of rain instead of snow, shortening the winter snowfall season and accelerating the rate at which the snowpack melts in the spring. The Sierra snowpack provides approximately 80% of California's annual water supply.

### *Local Climate Protection Efforts*

In response to the threat of climate change, local communities worldwide are voluntarily reducing greenhouse gas emissions even while national and international agreements are under development. By April 2008, all six local governments in Napa County committed to this process. Over the last several years, local governments and organizations in Napa County have taken actions to reduce GHG emissions and improve energy efficiency in the County. Examples of these include:

- Napa County has pioneered a pattern of "urban-centered growth," with powerful protection for agricultural lands and open space, sharply reducing the "sprawl" development pattern that is a principal contributor to vehicle-based GHG emissions
- Napa County has one of the highest levels of alternative energy generation per capita in the State of California
- Napa County has one of the highest landfill diversion rates in the state
- Additional efforts are included in the body of the report.

### *Climate Protection Co-Benefits*

More than just reducing carbon emissions, climate protection will yield other important benefits for Napa County residents.

- Support the Local Economy
- Save Money
- Support a Healthy Living Environment
- Develop Local Energy Resilience
- Improve Air Quality

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## *Napa's Carbon Footprint and Forecast*

Staff from all six Napa County jurisdictions participated in the development of a baseline Napa countywide community carbon footprint. The purpose of the baseline emissions inventory is to determine the levels of greenhouse gas emissions emitted in Napa County in 2005, the established base year for analysis and forecasting.

The community-scale Napa County inventory is based on the year 2005. When calculating the emissions inventory, all energy consumed in Napa County was included. This means that, even though the electricity used by local residents is produced elsewhere, this energy and emissions associated with it is accounted for in this inventory. The decision to calculate emissions in this manner reflects the general philosophy that a community should take full ownership of the impacts associated with its energy consumption, regardless of whether the generation occurs within the geographical limits of the community.

**2005 Napa Countywide Community Emissions by Jurisdiction**

| Jurisdiction | 2005 Emissions (metric tons of CO2 equivalents) | % of Total |
|---|---|---|
| Yountville | 28,305 | 2% |
| Calistoga | 28,427 | 2% |
| St. Helena | 46,052 | 4% |
| American Canyon | 91,449 | 8% |
| City of Napa | 455,062 | 38% |
| Unincorporated Napa County | 550,986 | 46% |
| **TOTAL 2005 NAPA COUNTYWIDE EMISSIONS** | **1,200,281** | |

*Together Unincorporated Napa County and the City of Napa* ***comprise 84% of countywide*** *GHG emissions.*

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**2005 Napa Countywide Per Capita Emissions by Jurisdiction**

| Jurisdiction | 2005 Emissions (metric tons of CO2 equivalents) | 2005 Population | Per Capita Emissions |
|---|---|---|---|
| Yountville | 28,305 | 3,400 | 8.33 |
| Calistoga | 28,427 | 5,200 | 5.47 |
| St. Helena | 46,052 | 6,100 | 7.55 |
| American Canyon | 91,449 | 14,200 | 6.44 |
| City of Napa | 455,062 | 76,600 | 5.94 |
| Unincorporated Napa County* | 550,986 | 28,600 | 19.27 |
| **TOTAL** | **1,200,281** | 134,100 | 8.95 |

* The relatively high Unincorporated Napa County per capita emissions result from an ICLEI inventory methodology that attributes regional transportation emissions based on where they occur rather than where the trip originates or ends. This methodology is consistent for all jurisdictions but impacts the unincorporated area most due to the fact that the majority of road miles in Napa are in the unincorporated area.

**2005 Napa Countywide Community Emissions by Sector**

| Sector | 2005 Emissions (metric tons of CO2 equivalents) | % of Total |
|---|---|---|
| Residential Buildings | 196,350 | 16% |
| Commercial & Industrial Buildings | 226,661 | 19% |
| Transportation | 636,724 | 53% |
| Lawn & Garden Equipment | 3,616 | 0% |
| Construction & Industrial/Commercial Equipment | 49,675 | 4% |
| Agriculture/Farming | 33,046 | 3% |
| Solid Waste | 54,209 | 5% |
| **TOTAL 2005 NAPA COUNTYWIDE EMISSIONS** | **1,200,281** | |

The greatest opportunities for reduction are in the transportation and building sectors, because they constitute 53% and 35% of the countywide GHG emissions.

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**2005 Napa Countywide Community Emissions by Source**

| Source | 2005 Emissions (metric tons of CO2 equivalents) | % of Total |
|---|---|---|
| Electricity | 207,962 | 19% |
| Natural Gas | 190,513 | 17% |
| Transportation Fuels | 636,724 | 57% |
| Agriculture/Farming | 33,046 | 3% |
| Solid Waste | 54,209 | 5% |
| **TOTAL 2005 NAPA COUNTYWIDE EMISSIONS*** | **1,122,454** | |

* Source total is different than sector and jurisdiction total, because it does not include data from lawn and garden equipment, construction & industrial/commercial equipment and electricity and natural gas use from suppliers other than PG&E.

### *2020 GHG Emissions Forecast*

Forecasting emissions to a projected target year (most often 2020) is done to create a more accurate picture of the emission reductions necessary to meet desired targets. Because of population increase, as well as growth in the jobs and transportation sectors, emissions will experience a background change not related to policy changes made by the local government. When creating an emissions reduction target, it is therefore important to consider not only emissions in the base year, but projected emissions in the target year, as these will need to be accounted for in the policies and measures taken to reduce GHG emissions in Napa County.

Please note the forecasted growth in GHG emissions assumes that **no actions** are taken to reduce emissions. In other words, this forecast considers neither the reduction impacts from the actions contained in this Framework nor benefits of increased mileage standards or changes to vehicle fleet mix.

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**2020 Napa Countywide Community Emissions Forecast by Jurisdiction**

| Jurisdiction | 2005 Emissions (metric tons) | 2020 Emissions (metric tons) | % Increase 2005 to 2020 |
|---|---|---|---|
| Yountville | 28,305 | 31,924 | 13% |
| Calistoga | 28,427 | 31,480 | 11% |
| St. Helena | 46,052 | 49,541 | 8% |
| American Canyon* | 91,449 | 152,393 | 67% |
| City of Napa | 455,062 | 544,572 | 20% |
| Unincorporated Napa County | 550,986 | 656,989 | 19% |
| **TOTAL** | **1,200,281** | 1,466,900 | 22% |

* The relatively high growth in GHG emissions for American Canyon is the result of ABAG projections that show high anticipated growth in the number of jobs and households between 2005 and 2020.

**2020 Napa Countywide Community Emissions Forecast by Sector**

| Sector | 2005 Emissions (metric tons) | 2020 Emissions (metric tons) | % Increase 2005 to 2020 |
|---|---|---|---|
| Residential Buildings | 196,350 | 219,924 | 12% |
| Commercial & Industrial Buildings | 226,661 | 292,783 | 29% |
| Transportation | 636,724 | 797,054 | 25% |
| Lawn & Garden Equipment | 3,616 | 4,053 | 12% |
| Construction & Industrial/Commercial Equipment | 49,675 | 59,839 | 20% |
| Agriculture/Farming | 33,046 | 33,046 | 0% |
| Solid Waste | 54,209 | 60,201 | 11% |
| **TOTAL** | 1,200,281 | 1,466,900 | 22% |

The full report contains the breakdown of these tables by jurisdiction.

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## *Six Goals and 53 Actions for GHG Reductions*

To reach the 2020 reduction target, the cities and the County of Napa will need to reduce GHG emissions countywide by 30 percent by 2020.

To achieve that 2020 target, Napa County must aggressively pursue reduction measures in every sector. For example, the transportation sector produces the greatest amount of Napa County's GHG emissions—approximately 55 percent. Ideally, emissions reduction strategies would yield the greatest results in this area. However, transportation is the sector least amenable to reduction actions, as discussed below. Thus to the extent that reductions are proportionally less in transportation due to the lack of available measures, short term *high-impact* opportunities in the electricity and natural gas sector must be pursued to compensate for transportation's shortfall, despite the fact that only about 36 percent of GHG emissions in Napa County come from electricity/natural gas. In the long term, reductions from all sectors will have to approach 80 percent by 2050 to meet the scientific imperative.

This document details six goals with 53 high-priority countywide actions intended to achieve the emissions goals. Staff from all Napa cities/towns and County participated in the drafting of the 53 countywide numbered actions outlined below. In addition, when appropriate, each jurisdiction provided additional local specificity regarding the development or implementation of a countywide action.

The Climate Action Framework's actions fall into six major goals:

5. **Expand Transportation and Mobility Options:** Shift transportation from fossil fuel vehicles to transit, walking, bicycling, and renewably powered vehicles and invest in Napa County jobs.
6. **Improve Buildings and Energy Efficiencies:** Invest in widespread energy and water efficiency to reduce demand; invest in Napa County renewable energy sources.
7. **Reduce Consumption and Solid Waste:** Significantly reduce the amount of waste produced in cities and the County.
8. **Conserve Agriculture, Natural Resources, and Urban Forests:** Protect our natural resources and farmland, and sequester carbon.
9. **Increase Community Engagement:** Market programs and conduct community outreach to increase participation in GHG reduction efforts.
10. **Improve Local Government Operations:** Lead by example by implementing policies and programs in jurisdiction operations and facilities.

The actions described in this Frameworkare not intended to be an exhaustive list of actions that the cities and County of Napa will undertake to achieve the 2020 objectives; they may do much more. However, these actions identified are the highest priority countywide actions. The Climate Action Framework includes goals for 2020, objectives and the actions needed to achieve these objectives. When implemented, these actions will enable the County and cities to meet the established emissions target.

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## *Framework Development Process*

In February 2009, the Napa County Transportation and Planning Agency (NCTPA), which includes staff and elected officials from all local jurisdictions, completed an initial countywide assessment of GHG emissions. This inventory was further refined in August 2009 and serves as the baseline for forecasting future emissions, as well as helping inform the actions identified in this Climate Action Framework.

City and County staff from all Napa County jurisdictions participated in a series of work sessions to develop a list of countywide actions to reduce GHG emissions with specific local actions identified whenever possible. This countywide list and other potential actions were subsequently evaluated using GHG reduction modeling software and expert analysis and studies. The result of this technical analysis is an estimate of expected GHG reductions and their associated costs.

The development of this Framework follows the "Five-Step Milestone Process" developed by ICLEI—Local Governments for Sustainability. This step-by-step process provides communities with a way to address a global problem at the local level—by adopting practices and policies to reduce GHG emissions, improve air quality, and enhance community livability and economic vitality.

- **Step 1—Baseline emissions inventory and forecast:** Current and forecast GHG emissions (if nothing is done) for transportation, electricity and natural gas, solid waste and agriculture in the County and cities of Napa.
- **Step 2—Emissions and reduction targets:** The specific reductions needed in each sector and jurisdiction to reach the 2020 goal.
- **Step 3—Local action plans:** The specific actions to be pursued in the local jurisdictions to reduce emissions (described in this Climate Action Framework and elaborated in future projects and program-specific plans).
- **Step 4—Implement policies and measures:** Cities and the County implement the Plan, while partners such as other local agencies, businesses, schools, non-profit organizations and individuals also embark on programs to reduce GHG emissions (major efforts are already underway).
- **Step 5—Monitor and verify results:** Ongoing monitoring will allow the Framework to evolve and be built on as new climate-related technology, policies, best practices and resources become available.

Each action in the Framework had to meet four criteria before being included: it must be under local control so that it can be implemented by local governments or businesses; it must lead to a significant reduction in GHG emissions (using the Napa County Carbon Model—see Appendix); it must be cost-effective over its life cycle in that it will pay for itself in energy cost savings; and it must be politically feasible.

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**Based on this Framework, local governments and agencies will aim to:**

- Develop forward-looking policies;
- Make progressive land use decisions;
- Encourage walking and biking;
- Encourage renewable energy development and use;
- Effectively use codes and ordinances;
- Sustainably manage landfills and waste treatment plants;
- Conserve agriculture and open space;
- Operate more integrated efficient public transportation networks; and
- Implement eco-friendly, sustainable practices.

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# I. Introduction and Background

Modern human activity, most notably the burning of fossil fuels for transportation and electricity generation, introduces large additional amounts of carbon dioxide and other greenhouse gases into the atmosphere. Reductions in the planet's forested regions, which absorb greenhouse gases, are also a major contributor to the increasing greenhouse effect. Global warming, a recent warming of the Earth's surface and lower atmosphere, is believed to be the result of an "enhanced greenhouse effect" mostly (more than 50%) due to human-produced increases in atmospheric greenhouse gases. Collectively, the burning of fossil fuel and deforestation intensify the natural greenhouse effect, causing global average surface temperature to rise, which in turn affects global climate patterns.

The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body established by the World Meteorological Organization and by the United Nations Environmental Programme. The IPCC was established to provide decision-makers with an objective source of information about climate change. The IPCC has called the evidence of the impacts of GHG on the world's climate "unequivocal." [1]

The 2005 regional population projections estimate Napa County's population at 133,574. The energy consumed and the waste produced within the county's boundaries result in thousands of tons of heat-trapping greenhouse gas emissions. But, as is evidenced by the widespread and active involvement of staff from all jurisdictions in Napa County in the development of a Climate Protection Action Framework, local governments are firmly committed to building on existing efforts to reduce the emissions that cause global warming.

Because we can only manage what we measure, the first step in managing greenhouse gas emissions, therefore, is to establish an inventory of those emissions. For a regional context, below is a chart of Bay Area County greenhouse gas emissions in tons of carbon dioxide equivalent (tons CO2e). California—considered as if were a country of its own—is the 16th largest GHG emitter in the world, second only to Texas in the US. However, per capita emissions in California are among the lowest in the US, and emissions in Napa County are less than the California average.

**Per Capita GHG Emissions for Bay Area Counties**[2]

| County | Electricity | Natural Gas | Transportation | Total | Population | Per Capita |
|---|---|---|---|---|---|---|
| **Alameda** | 4,086,682 | 2,786,826 | 8,547,708 | 15,421,215 | 1,509,981 | 10.2 |
| **Contra Costa** | 3,152,822 | 5,269,882 | 4,798,656 | 13,221,360 | 1,030,732 | 12.8 |
| **Marin** | 529,626 | 494,814 | 1,573,426 | 2,597,867 | 253,818 | 10.2 |
| **Napa** | 360,518 | 237,423 | 659,023 | 1,256,964 | 134,326 | 8.9 |
| **San Francisco** | 2,046,454 | 1,563,443 | 1,964,007 | 5,573,904 | 800,099 | 7.0 |
| **San Mateo** | 1,776,987 | 1,381,760 | 4,050,152 | 7,208,899 | 726,336 | 9.9 |
| **Santa Clara** | 5,871,420 | 2,903,755 | 9,441,863 | 18,217,038 | 1,780,449 | 10.2 |
| **Solano** | 1,108,005 | 2,861,777 | 2,723,614 | 6,693,397 | 421,542 | 15.9 |
| **Sonoma** | 1,080,805 | 783,478 | 2,499,586 | 4,363,869 | 478,222 | 9.1 |
| **Totals** | **20,013,319** | **18,283,158** | **36,258,035** | **74,554,512** | **7,135,505** | **10.5** |

[2] Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report: "Climate Change 2007"
[2] Climate Protection in the San Francisco Bay Area, September 2007, prepared by the Climate Protection Campaign.

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## *Climate Protection Imperative and GHG Reduction Target*

The principle underlying GHG emission reduction targets—and climate protection in general—is meeting the goal dictated by current scientific evidence to ensure that human societies remain in balance with the abilities of natural systems to sustain them. The amount of carbon dioxide in the atmosphere is the best single indicator of the climate crisis—the higher the concentration of carbon dioxide, the more dire the climate crisis. The concentration is now 390 parts per million and must return to 350, according to leading scientists.

Prior to 2005, California communities had a harder task setting GHG emission reduction targets than they do now. In 2005 Governor Schwarzenegger established GHG emission reduction targets for the state. In 2006 the Governor reinforced the 1990 level by 2020 target by signing into law AB 32, the Global Warming Solutions Act.

An example of the extent to which communities can go to set targets is Sonoma County, where the target-setting process for all nine cities and the County took about a year. As part of the process, representatives from government, business, youth and the community at large assembled for an all-day workshop to consider a target for Sonoma County. Their recommended target—25% below 1990 levels by 2015—was the boldest community target in the nation and was subsequently established by each Sonoma city and the County. The advantage of this approach was developing commitment and alignment among leadership of the various sectors of Sonoma County. The disadvantage was the large investment of time, attention, and funds.

With the passage of AB 32, California communities can now leap over the process of setting local targets by adopting the State's target as their own. Doing so has the benefit of synchronizing local goals with State goals. Additionally, communities can advance more quickly to climate protection planning and implementation.

Many communities have difficulty determining their 1990 baseline because data from 1990 is difficult to access. Recognizing this, the Air Resources Board, the California body charged with implementing AB 32, has stated that "reducing greenhouse gas emissions to 1990 levels means cutting approximately 30 percent from business-as-usual emission levels projected for 2020, or about 15 percent from today's levels."[3]

GHG emissions inventories for Napa cities and the County, completed in March 2009 in cooperation with ICLEI staff, used 2005 as the baseline year. Also shown are 2020 emissions projections if we do nothing and simply continue business as usual. The next column in the table shows the amount of emissions Napa cities and the County need to reduce from projected "do nothing" levels to meet a 2020 GHG emissions target that matches the target established by the State. The last column gives the percentage reduction required to meet AB 32 goals: a 30% countywide reduction.

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[3] Climate Change Proposed Scoping Plan: A Framework for Change," California Air Resources Board, October 2008.

**GHG Emissions: 30% Reduction Countywide**

| | 2005 Baseline | 1990 Level (metric tons) | 2020 "Do Nothing" forecast | Reduction Needed (tons) | % Reduction Needed |
|---|---|---|---|---|---|
| A. Canyon | 91,449 | 77,732 | 152,393 | 74,662 | 49% |
| Calistoga | 28,427 | 24,163 | 31,480 | 7,317 | 23% |
| City of Napa | 455,062 | 386,803 | 544,572 | 157,769 | 29% |
| St. Helena | 46,052 | 39,144 | 49,541 | 10,397 | 21% |
| Yountville | 28,305 | 24,059 | 31,924 | 7,865 | 25% |
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| **Total** | **1,200,281** | **1,020,239** | **1,466,900** | **446,661** | **30%** |

*Note that the relatively high % reduction indicated for American Canyon is based on projected increases in GHG emissions due to increased traffic **through** the city as well as increased growth, planned to balance reduced growth elsewhere in the County and the region. Specific local reduction goals, not mandated by state regulation, will be addressed by State and Regional regulations and plans being developed now.*

## Local Climate Change Impact

Climate change is primarily a global problem influenced by an array of interrelated factors, many of which are beyond the control of local communities. Such national and global factors include national and global energy policies, the structure of the international energy economy, and the state of energy technology research and development. Climate change is also a local problem with serious local effects foreseen for the cities and County of Napa. Local communities can also make changes that will contribute to the necessary global reduction of GHGs. Some of the possible local effects of climate change are described below.

### Sea Level Rise

According to the San Francisco Bay Conservation and Development Commission (BCDC), the sea level in the Bay Area is expected to rise up to 55 inches during the next hundred years. The Pew Center on Climate Change has reported that such a rise would result in the erosion of beaches, bay shores and river deltas, marshes and wetlands and increased salinity of estuaries, marshes, rivers and aquifers.[4] This increased salinity has the potential to damage or destroy crops in low-lying farmlands. Infrastructure at or near sea level, such as harbors, bridges, and roads, would also be impacted by a rising sea level.

BCDC has modeled the impact of sea level rise for two different scenarios (16 inches at mid-century and 55 inches at the end of the century). These models illustrate that portions of Napa County, particularly along the Napa River, may be subject to increased flooding with just 16 inches of sea level rise.. The Federal Emergency Management Adminstration (FEMA) is also currently studying the effects of rising sea levels with regards to local flooding hazards and they will be providing guidance to local jurisdictions regarding such hazards should they be scientifically quantifiable and attributable to Climate Change.

[4] Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and its Shoreline. BCDC. April 2009.

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## Agriculture

Climate change is projected to have significant impacts on conditions affecting agriculture, including temperature, carbon dioxide, snow pack run-off, precipitation and the interaction of these elements. Changing these elements could impact the growing season and current wine growing regions in Napa County. A key change in climate that will affect wine production is an increase in temperature. This is primarily because the temperature of land heats up much faster than the sea. Higher temperatures also mean more humidity and likelihood of heavier rainfalls. The total level of rain may not change, but rain will occur less frequently and in large bursts, resulting in less absorption and a decrease in water availability in vineyards.

Climate change could change the style and variety of grapes cultivated in Napa. These issues are subjects of intensive study and research by the Napa Valley vintner community. Napa Valley Vintners (NVV), the non-profit trade association with over 325 winery members in Napa, have created a Climate Change Task Force, working with geophysicists from Scripps Institute of Oceanography and local vineyard managers to study potential climate change effects in Napa Valley and to develop an accurate model for how viticulture and winemaking practices might be adjusted.

## Native Plants and Wildlife

Napa County is home to a particularly diverse population of plants. Napa County has one of the highest biodiversity levels in the nation and contains 1,102 different native plants, or 32% of the state's native flora. The County's plants and vegetation support many wildlife species including many rare, threatened, and endangered species.

Native plants and animals are also at risk as temperatures rise. Scientists are reporting more species moving to higher elevations or more northerly latitudes in response. Increased temperatures also provide a foothold for invasive species of weeds, insects and other threats to native species. The increased flow and salinity of water resources could also seriously affect food and mating conditions for fish that are of both of economic and recreational interest to residents. In Napa County, climate change may result in decreased genetic diversity, a reduction in seed dispersal, decreased or extirpated population, and long-term distribution changes.

## Water

With warmer average temperatures, more winter precipitation will fall in the form of rain instead of snow, shortening the winter snowfall season and accelerating the rate at which the snowpack melts in the spring. The Sierra snowpack provides approximately 80% of California's annual water supply.

Napa County is subdivided by parallel northwest-trending mountain ridges into three principal watersheds: Napa River watershed, Putah Creek/Lake Berryessa watershed, and Suisun Creek watershed. The major aquifer in the County is the north Napa Valley groundwater basin. Domestic, commercial, and industrial water is derived from surface water (53%), including significant supplies from the State Water Project and groundwater (47%).[5] Most of the County's population lives in incorporated jurisdictions that rely on surface water. Climate change is

[5] Napa County Baseline Data Report, Chapter 15 Surface Water Hydrology, November 30, 2005.

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projected to impact the amount and type of water supply in California. Consequentially, Napa County may not be able to rely on past water sources.

## Drought, Wildfires and Flooding

Natural disasters such as droughts, wildfires and flooding can be instigated by temperature and precipitation changes. Currently precipitation varies significantly throughout Napa County, with annual precipitation ranging from 22.5 to 75 inches per year.

Climate models that predict a 4ºF temperature increase in the next 20 to 40 years, show an increase in the number of long dry spells, as well as a 20-30% increase in precipitation in the spring and fall. Intense storms can cause flooding and mudslides, resulting in potentially costly damages to property, infrastructure and even human life in Napa County.

Fluctuating weather patterns and rising temperatures resulting from climate change may change the frequency and intensity of droughts in the region and state. Consequentially, water supplies may be stressed, requiring flexibility and robustness to be built into water supply systems.

In addition, an increase in wildfires due to continued dry periods and high temperatures is another expected impact of climate change.

## Public Health

Warming temperatures and changes in precipitation resulting from climate change can also encourage mosquito breeding and the diseases that come with mosquitoes, such as the West Nile Virus, a disease of growing concern in the Napa region. Fluctuating seasons and temperatures could result in more extreme heat waves and cold spells in Napa County, with associated health effects.

## *Local Climate Protection Efforts*

In response to the threat of climate change, local communities worldwide are voluntarily reducing greenhouse gas emissions even while national and international agreements are under development. The Kyoto Protocol, an international effort to coordinate mandated reductions, went into effect in February 2005 with 161 countries participating (not including the United States). The successor to the Kyoto Protocol is presently being negotiated with active participation by the United States.

By April 2008, all six local governments in Napa County committed to becoming members of the ICLEI – Local Governments for Sustainability, an association of more than 1,105 national and regional and local government organizations worldwide that have made a commitment to sustainable development and that share information. Napa's local governments are also participating in the development of this Napa Countywide Community Climate Action Framework sponsored by the Napa County Transportation and Planning Agency (NCTPA) and funded by the Bay Area Air Quality Management District (BAAQMD).

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## Existing Napa Climate Protection Programs

Over the last several years, local governments and organizations in Napa County have taken actions to reduce GHG emissions and improve energy efficiency in the County. Examples of these include:

- Napa County has pioneered a pattern of "urban-centered growth," with powerful protection for agricultural lands and open space, sharply reducing the "sprawl" development pattern that is a principal contributor to vehicle-based GHG emissions
- Napa County has one of the highest levels of alternative energy generation per capita in the State of California
- Napa County has one of the highest landfill diversion rates in the state
- Napa County agricultural practices focus on limited use of nitrogen-based fertilizers as well as integrated pest management strategies both of which reduce GHG emissions
- The City of Napa's long-term water management strategy commits the city to implementing the appropriate water conservation best management processes to ensure future supply reliability.
- The City of Napa recently adopted the county's first green building code to cut energy and water usage.
- The City of Napa leads the State in electronics recycling; the City of Napa, Napa Recycling and Waste Services (NRWS) and local residents and businesses did their part for the environment by collecting over 65 tons of unwanted computer monitors, televisions, cell phones and other electronic waste for proper reuse and/or recycling.
- Napa County General Plan sets a concrete goal for the year 2030 of reducing 50% the number of work trips in private automobiles.
- City of St. Helena's General Plan Update's Climate Change Element includes goals, policies and programs aimed at significantly reducing GHG emissions in the city.
- The City of St. Helena and the Climate Protection Task Force is in the process of developing a Climate Action Plan for the city that supports the Climate Change Element and this Napa Countywide Community Climate Action Framework.
- Over 60 businesses in Napa County have qualified as a Bay Area Green Business through a regional program hosted by Napa County and NCTPA.
- The Napa County Sheriff's Department headquarters is an environmentally-friendly government building, using materials, heating and cooling systems that reduce energy consumption and unnecessary reliance on natural resources.
- The Napa wine industry has already shown strong leadership in transitioning to renewable energy sources, preventing pollution, conserving resources, and complying with environmental standards. Napa Sustainable Winegrowers Group is dedicated to promoting sustainable farming practices including natural farming, Integrated Pest Management (IPM), pesticide reduction or elimination and, restoration of natural habitats on vineyard properties.
- Napa Valley Vintners "Napa Green Winery" certification program recognizes thirty-nine Napa wineries for their water and energy conservation, pollution prevention and solid waste reduction efforts. "Napa Green Land" includes over 33,000 acres of farmed and unfarmed land in Napa with the intention to restore, protect, and enhance the regional watershed.

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- The City of Napa's $40 million water treatment plant upgrade in Jamieson Canyon improved the energy efficiency of the facility. Two large solar arrays help power the City of Napa's water pump station at Lake Hennessey.
- Napa County enforces strict regulations on soil erosion and development of open land, limiting destruction caused by soil runoff and development of unstable, steep or otherwise unsuitable lands.
- Sustainable Napa County, a non-profit organization, funded energy audits for local nonprofit agencies, hosts education sessions to help cities and the building industry learn about new ordinances that promote energy efficiency in new development.
- The Napa Valley Recycling Environmental Awareness Team and the Napa County Green Party offers awards recognizing businesses' efforts to undertake sustainable practices in Napa County.
- The Land Trust of Napa County works with jurisdictions to protect open space land in the county.
- Napa Green, part of the Napa County Farm Bureau, hosts the Certified Land/Fish Friendly Farming Program, which is a voluntary program for grape growers and vintners that enhances the watershed and restores habitat with sustainable agriculture practices.
- Napa Valley College is home to a massive solar field, using technology that allows the panels to turn slowly with the arc of the sun to capture as much solar power as possible.

## *Climate Protection Co-Benefits*

More than just reducing carbon emissions, climate protection will yield other important benefits for Napa County residents.

### Support the Local Economy

Shifting to a low-carbon future provides local jobs for residents, and supports local businesses. Napa also has potential to develop new renewable energy sources within the County. Jobs may be created once the identified actions are underway. Retrofitting buildings, for example, results in the creation of local employment opportunities for community members. Acting to reduce travel distances encourages support of local and neighborhood businesses.

### Save Money

Most of the actions in this framework are cost-effective and are improvements that will pay for themselves. For example, retrofitting residential units and commercial space saves energy costs. In the same way, energy-efficient actions for waste and water facilities will result in additional energy cost savings.

### Support a Healthy Living Environment

Every day, community members and visitors of the Cities, Town and County of Napa travel to a variety of places—they commute to work, drive to the store, go to the doctor, go out for dinner and visit wineries. Currently 53% of the countywide GHG emissions are produced by the transportation sector. To lower emissions, a high-quality transportation system must include a

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mix of convenient public transit, bicycling, walking, car sharing, energy-efficient vehicles and the development of transit-oriented neighborhoods.

Actions in this framework support the development of healthy urban centers that are walkable and bikeable, include a variety of neighborhood-serving services and goods, and provide public transit options. Actions will also support the protection and preservation of Napa's agricultural lands and significant natural resources.

## Develop Local Energy Resilience

As greater demands are placed on our system of energy generation and supply, vulnerabilities become more apparent. To be more secure, local communities can be more efficient and move to local renewable power sources. The northern parts of Napa Valley are particularly rich in potential geothermal resources.

## Improve Air Quality

Climate protection actions clean polluted air—reducing carbon monoxide, sulfur dioxide, benzene, and particulates— which contributes to a healthy environment locally and regionally.

## Napa as a Model

Napa County can expand its international reputation by serving as a model for jurisdictions worldwide by taking a collaborative regional approach to fighting local emissions with targeted policies and actions, building on existing efforts countywide. In Napa County, businesses have already achieved huge gains in energy efficiency; environmental organizations have helped businesses and government to craft innovative green policies; schools have incorporated environmentally friendly practices in their facilities and programs; and foundations have funded many of these efforts. Residents do their share as well, taking numerous actions inside and outside their homes.

# *Five-Step Planning Process*

To develop the Framework, Napa jurisdictions followed the "Five-Step Milestone Process" developed by ICLEI. This step-by-step process provides communities with a way to address a global problem at the local level—by adopting practices and policies to reduce GHG emissions, improve air quality, and enhance community livability and economic vitality.

## Step 1: Baseline Emissions Inventory and Forecast

The County and cities of Napa completed a countywide inventory of Napa County GHG emissions in March 2009, which was refined in August 2009. The inventory included GHG emissions from the following sectors:

- Transportation
- Electricity and natural gas
- Solid waste
- Agriculture

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## Step 2: Emissions and Reduction Targets

Underlying GHG emissions reduction targets is the need to meet the scientific imperative, the goal dictated by current scientific evidence to ensure that human societies remain in balance with the abilities of natural systems to sustain them. With the passage of AB 32, California communities can now leap over the process of setting local targets by adopting the State's target as their own. This has the benefit of harmonizing local goals with state goals. Additionally, communities can advance more quickly to climate protection planning and implementation. GHG emissions inventories for Napa cities and the County completed in March 2009 used 2005 as the baseline year, and matched Napa's GHG reduction target with that of the State. Specific formal GHG reduction targets for the Bay Area region (and all of California's regions) are currently (November 2009) under development by the California Air Resources Board, as provided for in AB 32. How those state-mandated regional reductions will be allocated locally is also still under consideration.

## Step 3: Local Action Plans

Climate Action Plans and Frameworks such as this one detail actions to be pursued and the emissions reductions necessary to meet the target (see "High-Leverage, High-Impact Actions" below for how the actions were developed). This is not an exhaustive list of every effort that the cities and County should undertake to achieve the 2020 objectives; they might do much more.

## Step 4: Implement Policies and Measures

Major efforts are already underway in Napa County to reduce emissions. All cities and the County are considering and/or have implemented energy efficiency programs, along with programs to generate energy through solar power and other renewables. Similarly, many other local agencies, businesses, and schools have embarked on programs to reduce GHG emissions. Successfully implementing the objectives and actions in this Climate Action Framework will require many diverse partners, including non-profit organizations, business leaders, neighborhood associations and individual residents.

## Step 5: Monitor and Verify Results

This Climate Action Framework is a foundation that will be revised and built upon in the years to come. Reduction strategies and actions will continue to evolve as new climate-related technology, policy, best practices and resources become available.

## *High-Impact, High-Leverage Actions*

The role of this Framework is to identify actions that yield both the highest impact and the highest leverage effects on Napa County's GHG emissions. High-impact actions are those calculated to produce the greatest GHG emission reductions in the shortest time period.[6] High-

[6] The high-impact actions were analyzed using a Carbon Model customized for this Plan (see Appendix D). The Napa Carbon Model is a mathematical representation of all of the significant sources of direct and indirect $CO_2$ emissions in Napa County, and the quantity of emissions from each source. The model represents emissions impacts in categories referred to as "opportunities for intervention." To quantify the impacts of the actions in this plan, therefore, the actions had to be grouped according to the appropriate opportunity for intervention.

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leverage actions are those that Napa County is best positioned to accomplish. Combined, they lead to the "Six Strategies for GHG Reduction."

Four criteria used to evaluate and develop high priority actions for this Framework include:

1. Is it under local control?
2. Will it lead to significant GHG emission reductions?
3. Is it cost-effective?
4. Is it politically feasible?

## 1. Under Local Control

The easiest filter to apply for potential Napa County actions is whether the action is under local control. All proposed actions in this Framework can be implemented by Napa local governments, businesses or individuals.

It is important to note some of the most significant sources of and solutions for climate change are not under local authority; . For example, Napa local governments do not control fuel efficiency standards for vehicles even through these standards greatly impact local production of GHG emissions.

## 2. Significant GHG Emission Reductions

To achieve the highest level of reductions the most rapidly, Napa County's largest sources of emissions were considered (see section titled "Napa's Carbon Footprint").

To assess the impacts of these major actions, the Climate Protection Campaign's Carbon Model was adapted to the data and conditions that exist in Napa County.[7] The model is a mathematical representation of "opportunities for intervention" and was used to evaluate the cost effectiveness of a set of sector-specific measures, resulting in a bottom-line carbon reduction per dollar invested value for the major sectors addressed in this Framework.

The Carbon Model is composed of several sub-models:

- Transportation—models the effect on carbon emissions from changes in our transportation system. Measures that are modeled include mode share shift,[8] land use change and non-emitting vehicle use.
- Electricity and natural gas end use—models the effect of efficiency improvements on end uses of electricity and natural gas in the residential and commercial sectors.
- Electricity fuel mix—estimates the effect of changing the percentage of non-emitting electricity generation sources used to produce electricity supplied on the grid. Non-emitting sources could include renewable energy like wind, solar and geothermal.

Also, opt-out actions—those actions that are implemented unless a customer explicitly declines an offered service or measure—were favored over those that are opt-in because of the higher

[7] Appendix D: Carbon Model

[8] Mode share is the percentage of total transportation miles that are accomplished using each mode of transportation (e.g., walking, bicycling, driving, or use of public transportation). Shift is the percent of change from one mode to another.

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level of adoption rate with opt-out measures. The higher the adoption rate, the greater are the reductions in energy demand and GHG emissions. Opt-in actions generally rely on costly marketing efforts to achieve significant results. Opt-out actions help ensure that actions are deployed at the widespread scale needed.

There are typically several well-observed barriers to affecting individual behavior modification that results in substantial GHG reductions—especially in the short run. Some of these barriers include the perception that conservation involves sacrifice, that investing in efficiency "isn't worth it," or that there's nothing any single person can do, etc. Thus, the approach to analyzing the high priority actions did not focus on behavioral change, but rather analyzed the "value proposition" of these actions. This approach will better support ongoing public education, community engagement and decision-making.

And finally, the analysis included the political and institutional challenges posed by the Community Choice Aggregation (CCA) law (AB 117) that helps local communities control and purchase renewable electricity for its residents and businesses.

## 3. Cost-Effective

The cost to implement the recommended actions was estimated, to the extent possible. In many cases, thorough economic analyses exceeded the bounds of this study, as did an economic analysis of the impact on the County of the package of all proposed actions.

The hierarchy used in evaluating cost effectiveness for reducing GHG emissions (i.e., net cost per ton of carbon avoided, in order of most to least cost-effective) is as follows[9]:

1. Conservation including demand reduction
2. Energy efficiency
3. Renewable, distributed, and localized energy sources
4. Carbon offsets[10] as a last resort when other options are not feasible

Within each level of the hierarchy, the cost-effectiveness of each action is maximized by:

- Using the best available technology
- Using the lowest cost capital for financing
- Lowering or removing the initial capital barrier
- Capturing the created revenue stream for repayment of financed costs

Using this approach minimizes the cost per ton of GHG reduced. The lifecycle cost of the measures is the net present value (NPV) of the investment with savings from reduction in fuel cost as an income stream.

[9] This hierarchy parallels the ranking for efficiency measures or "loading order" adopted by the California Energy Commission, "Implementing California's Loading Order for Electricity Resources," California Energy Commission, 2005, http://www.energy.ca.gov/2005publications/CEC-400-2005-043/CEC-400-2005-043.PDF

[10] Carbon offsets are a financial instrument aimed at a reduction in greenhouse gas emissions. Carbon offsets are measured in metric tons of carbon dioxide equivalent. One carbon offset represents the reduction of one metric ton of carbon dioxide or its equivalent in other greenhouse gases.

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The approach taken by this framework for each sector is as follows:

1. Identify the end uses or activities that that account for 80 percent or more of emissions
2. Apply the loading order[11] analysis to reduce emissions at the minimum cost
3. Identify an optimal financing structure to produce the lowest lifecycle cost of the total set of measures

## 4. Politically Feasible

Political feasibility is a function of priorities and public will. When perceptions of risks and benefits shift, action follows. The abolition of slavery, human rights, and universal suffrage demonstrate how grand change happens through time. As well, mobilization for change can happen quickly when seemingly impossible action suddenly becomes mandatory. The political context for climate protection is changing rapidly as knowledge and awareness of the climate crisis accelerates daily, as does the conviction that strong action must be taken not only for ourselves but also for our children and our children's children.

## Comprehensive Actions

As a result of using these four criteria, the actions outlined in this framework identify ways to:

- Lower economic barriers to adoption of high performance energy efficiency measures;
- Develop cost-effective ways to transition to electricity and heating/cooling from renewable, non-emitting energy sources;
- Create cost-effective and convenient automobile alternatives by promoting the development of less carbon intense or non-carbon emitting transportation modes;
- Develop land use policies to minimize GHG emissions;
- Redesign municipal services to emphasize demand reduction;
- Change agricultural and forestry practices to further reduce carbon impact from the business-as-usual scenario; and
- Adopt the lowest cost financing methods to replace fossil fuel-based energy with renewables.

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[11] The loading order was developed by California's principal energy agencies to guide energy decisions according to cost effectiveness. It prioritizes decreasing electricity demand by increasing energy efficiency and demand response, and meeting new generation needs first with renewable and distributed generation resources, and second with clean fossil-fueled generation. The loading order was adopted in the 2003 Energy Action Plan prepared by the energy agencies and the Energy Commission's 2003 Integrated Energy Policy Report (2003 Energy Report) used the loading order as the foundation for its recommended energy policies and decisions, http://www.energy.ca.gov/2005publications/CEC-400-2005-043/CEC-400-2005-043.PDF

# II. Napa's Carbon Footprint and Forecast[12]

ICLEI – Local Governments for Sustainability and the Bay Area Air Quality Management District (BAAQMD) hosted a technical workshop at the Napa County Transportation and Planning Agency (NCTPA) for the purpose of generating preliminary greenhouse gas (GHG) baseline emissions inventories for all six Napa County jurisdictions. Staff from all six Napa County jurisdictions were present and participated in the development of the Napa countywide community carbon footprint. The results from this inventory were validated and refined by the technical consultants at the Climate Protection Campaign.

## *GHG Emissions Inventory*

The baseline inventory was produced by ICLEI in partnership with the Napa County Climate Action consultants (MIG and the Climate Protection Campaign) and staff from NCTPA and all six Napa County jurisdictions. The purpose of the baseline emissions inventory is to determine the levels of greenhouse gas emissions emitted in Napa County in 2005, the established base year for analysis and forecasting.

ICLEI's Cities for Climate Protection inventory methodology allows local governments to systematically estimate and track greenhouse gas emissions from transportation, energy and waste related activities at the community-wide scale.

Once completed, these inventories provide the basis for creating an emissions forecast and reduction target, and enable the quantification of emissions reductions associated with implemented and proposed measures.

### GHG Emissions Analysis Software

To facilitate local government efforts to identify and reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) software package. This software estimates emissions derived from energy consumption and waste generation within a community. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions are aggregated and reported in terms of carbon dioxide equivalent units, or $CO_2e$. Converting all emissions to carbon dioxide equivalent units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat, so the model converts one ton of methane emissions to 21 tons of $CO_2e$.

The emissions coefficients and methodology employed by the software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National GHG Emissions Inventories), the US Voluntary Greenhouse Gas Reporting Guidelines (EIA Form1605), and, for emissions generated from solid waste, the US EPA's Waste Reduction Model (WARM).

The CACP software has been and continues to be used by over 250 US local governments to reduce their greenhouse gas emissions. However, it is worth noting that, although the software provides all Napa County jurisdictions with a sophisticated and useful tool, calculating

[12] See Appendix B for consolidated countywide carbon footprint.

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emissions from energy use with precision is difficult. *The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation rather than an exact value.*

## GHG Emissions Inventory Data Sources

An inventory of greenhouse gas emissions requires the collection of information from a variety of sectors and sources. Here is a brief summary of the data sources. (For an in-depth review of data sources, methods and protocols used to compute the GHG emissions please see Appendix C, "Methodology—ICLEI.")

### Built Environment: Residential, Commercial and Industrial Sectors

#### Data Sources

- Utility electricity and natural gas consumption for 2005 was provided by PG&E. Data is reported at an aggregate level for each sector – Residential, Commercial and Industrial.[13]
- Countywide Direct Access electricity consumption (purchased directly from the power generator, not through PG&E) for Napa County was obtained from the California Energy Commission.

#### What is not included in this data?

- Fuel sources not delivered by PG&E. For example, wood, charcoal, propane, kerosene, diesel, heavy fuel oil, etc. In California, this largely results in an exclusion of industrial process emissions, not a factor in Napa County.
- Perflourocarbons (PFCs), hydrofluorocarbons (HFCs), sulfur hexafluoride ($SF_6$). This data is typically prohibitively difficult to obtain.

### Waste Sector

#### Data Sources

- **Landfill Emissions:** total captured and fugitive emissions (methane emissions) released from any landfills located in each jurisdiction in the baseline year
- **Lifetime Decomposition Associated with Waste Generated:** total emissions (methane emissions) from solid waste generated in each jurisdiction in the baseline year that was sent to landfills, regardless of whether they are located within or outside of each jurisdiction's boundaries.
- Total emissions (methane emissions) from the Alternative Daily Cover (ADC) used in the landfills where the waste generated in each jurisdiction is disposed.

#### What is not included in this data?

- Any GHG emissions considered to be biogenic in origin[14] are not included in this data.

[13] Commercial and Industrial are often bundled together. Industrial customers are subject to State PUC confidentiality laws—15/15 rule—if they consume a certain proportion of the electricity within the local government. Consequentially, all Napa County jurisdictions had at least a portion of the industrial consumption reported in the commercial sector, and any reported emissions from the industrial sector constitute only a subset of actual industrial emissions.

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## Transportation/Mobile Emissions Sector

### Data Sources

- Local Roads 2005 Vehicle Miles Traveled (VMT) data was obtained from Caltrans, which compiles and publishes statewide VMT data annually through the Highway Performance Monitoring System.[15] Caltrans obtains VMT data on local roads from regional transportation planning agencies and councils of governments across the state. For the San Francisco Bay Area, Caltrans obtains data from the Metropolitan Transportation Commission (MTC). MTC obtains VMT data on local roads either from the local governments within its jurisdiction or, if that data is unavailable, through a Caltrans model. Since this data reports all travel on roads in Napa County, it includes trips that neither originate nor end in Napa. This "pass through" travel is projected to be a growing portion of local road volume, especially in the southern part of the county and the city of American Canyon. Thus a potentially significant portion of the projected growth in transportation sector GHG emissions represents growth in our neighboring counties. This highlights the fact that Napa's GHG reduction strategies exist within an active ongoing region-wide reduction effort.
- State Highways Vehicle Miles Traveled (VMT) 2005 data was also obtained from Caltrans, with daily VMT by road segment.
- Off-road non-point source emissions were obtained by the California Air Resources Board.

### What is not included in this data?

- Emissions associated with port or airport operations
- Rail transit emissions
- This methodology will not reflect the use of any fuels besides gasoline and diesel
- Perflourocarbons (PFCs), Hydrofluorocarbons (HFCs), Sulfur Hexafluoride ($SF_6$). This data is typically prohibitively difficult to obtain.
- Transportation emissions associated with the growth of vineyard acreage, projected at 10,000 additional acres by 2030

In short, after some initial manipulation of the raw data from these sources, these data were entered into the CCAP software to generate a community emissions inventory. The community inventory represents an estimated overview of the energy used and waste produced within Napa County and its contribution to greenhouse gas emissions.

The community-scale Napa County inventory is based on the year 2005. When calculating the emissions inventory, all energy consumed in Napa County was included. This means that, even though the electricity used by local residents is produced elsewhere, this energy and emissions associated with it is accounted for in this inventory. The decision to calculate emissions in this manner reflects the general philosophy that a community should take full ownership of the impacts associated with its energy consumption, regardless of whether the generation occurs within the geographical limits of the community.

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[14] A biogenic substance is produced by life processes including greenhouse gas emissions from fossil-based products (incineration or decomposition) and from organic waste handling and decay.
[15] The 2005 report is available at: http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2005PRD.pdf.

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**2005 Napa Countywide Community Emissions by Jurisdiction**

| Jurisdiction | 2005 Emissions (metric tons of CO2 equivalents) | % of Total |
|---|---|---|
| Yountville | 28,305 | 2% |
| Calistoga | 28,427 | 2% |
| St. Helena | 46,052 | 4% |
| American Canyon | 91,449 | 8% |
| City of Napa | 455,062 | 38% |
| Unincorporated Napa County | 550,986 | 46% |
| **TOTAL 2005 NAPA COUNTYWIDE EMISSIONS** | **1,200,281** | |

*Together Unincorporated Napa County and the City of Napa **comprise 84% of countywide** GHG emissions.*

**2005 Napa Countywide Per Capita Emissions by Jurisdiction**

| Jurisdiction | 2005 Emissions (metric tons of CO2 equivalents) | 2005 Population | Per Capita Emissions |
|---|---|---|---|
| Yountville | 28,305 | 3,400 | 8.33 |
| Calistoga | 28,427 | 5,200 | 5.47 |
| St. Helena | 46,052 | 6,100 | 7.55 |
| American Canyon | 91,449 | 14,200 | 6.44 |
| City of Napa | 455,062 | 76,600 | 5.94 |
| Unincorporated Napa County* | 550,986 | 28,600 | 19.27 |
| **TOTAL** | **1,200,281** | 134,100 | 8.95 |

* The relatively high Unincorporated Napa County per capita emissions result from an ICLEI inventory methodology that attributes regional transportation emissions based on where they occur rather than where the trip originates or ends. This methodology is consistent for all jurisdictions but impacts the unincorporated area most due to the fact that the majority of road miles in Napa are in the incorporated area.

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**2005 Napa Countywide Community Emissions by Sector**

| Sector | 2005 Emissions (metric tons of CO2 equivalents) | % of Total |
|---|---|---|
| Residential Buildings | 196,350 | 16% |
| Commercial & Industrial Buildings | 226,661 | 19% |
| Transportation | 636,724 | 53% |
| Lawn & Garden Equipment | 3,616 | 0% |
| Construction & Industrial/Commercial Equipment | 49,675 | 4% |
| Agriculture/Farming | 33,046 | 3% |
| Solid Waste | 54,209 | 5% |
| **TOTAL 2005 NAPA COUNTYWIDE EMISSIONS** | **1,200,281** | |

The greatest opportunities for reduction are in the transportation and building sectors, because they constitute 53% and 35% of the countywide GHG emissions.

**2005 Napa Countywide Community Emissions by Source**

| Source | 2005 Emissions (metric tons of CO2 equivalents) | % of Total |
|---|---|---|
| Electricity | 207,962 | 19% |
| Natural Gas | 190,513 | 17% |
| Transportation Fuels | 636,724 | 57% |
| Agriculture/Farming | 33,046 | 3% |
| Solid Waste | 54,209 | 5% |
| **TOTAL 2005 NAPA COUNTYWIDE EMISSIONS*** | **1,122,454** | |

* Source total is different than sector and jurisdiction total, because it does not include data from lawn and garden equipment, construction & industrial/commercial equipment and electricity and natural gas use from suppliers other than PG&E.

## *2020 GHG Emissions Forecast*

Forecasting emissions to a projected target year (most often 2020) is done to create a more accurate picture of the emission reductions necessary to meet desired targets. Because of population increase, as well as growth in the jobs and transportation sectors, emissions will experience a background change not related to policy changes made by the local government. When creating an emissions reduction target, it is therefore important to consider not only

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emissions in the base year, but projected emissions in the target year, as these will need to be accounted for in the policies and measures taken to reduce GHG emissions in Napa County.

The 2020 GHG emissions estimates are based on household, population, and job forecasts from ABAG's policy-based *Projections 2005*. The ABAG 2005 growth projections have been revised downward slightly for 2009; however, since 2005 was used as the baseline year, this same year was used for forecasting.

The compounded annual growth rate of 1.509% for the transportation sector is a statewide projection derived from the California Energy Commission report titled "Transportation Energy Forecasts for the 2007 Integrated Energy Policy Report." Over the 15-year forecast period, this projected annual growth rate results in a 25% increase in transportation emissions forecasted for 2020.

Please note the forecasted growth in GHG emissions assumes that **no actions** are taken to reduce emissions. In other words, this forecast considers neither the reduction impacts from the actions contained in this Framework nor benefits of increased mileage standards or changes to vehicle fleet mix.

**2020 Napa Countywide Community Emissions Forecast by Jurisdiction**

| Jurisdiction | 2005 Emissions (metric tons) | 2020 Emissions (metric tons) | % Increase 2005 to 2020 |
|---|---|---|---|
| Yountville | 28,305 | 31,924 | 13% |
| Calistoga | 28,427 | 31,480 | 11% |
| St. Helena | 46,052 | 49,541 | 8% |
| American Canyon* | 91,449 | 152,393 | 67% |
| City of Napa | 455,062 | 544,572 | 20% |
| Unincorporated Napa County | 550,986 | 656,989 | 19% |
| **TOTAL** | **1,200,281** | 1,466,900 | 22% |

* The relatively high growth in GHG emissions for American Canyon is the result of ABAG projections that show high anticipated growth in the number of jobs and households between 2005 and 2020.

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**2020 Napa Countywide Community Emissions Forecast by Sector**

| Sector | 2005 Emissions (metric tons) | 2020 Emissions (metric tons) | % Increase 2005 to 2020 |
|---|---|---|---|
| Residential Buildings | 196,350 | 219,924 | 12% |
| Commercial & Industrial Buildings | 226,661 | 292,783 | 29% |
| Transportation | 636,724 | 797,054 | 25% |
| Lawn & Garden Equipment | 3,616 | 4,053 | 12% |
| Construction & Industrial/Commercial Equipment | 49,675 | 59,839 | 20% |
| Agriculture/Farming | 33,046 | 33,046 | 0% |
| Solid Waste | 54,209 | 60,201 | 11% |
| **TOTAL** | 1,200,281 | 1,466,900 | 22% |

## 2020 Napa Countywide Community Emissions Forecast for each Jurisdiction

### American Canyon

American Canyon's communitywide emissions are expected to increase by 67% by 2020 due primarily to ABAG projected job growth of 2,410 jobs in 2005 to 6,590 jobs in 2020. As noted earlier, this forecast assumes a business as usual or do nothing scenario. To the extent that the commercial and industrial buildings use renewable energy and are highly energy efficient, this anticipated growth in emissions can be significantly reduced. Furthermore, if these new jobs go to local residents, it will reduce the vehicle miles traveled by residents and thereby reduce GHG emissions in the transportation sector. Also, as mentioned above, a significant portion of the transportation sector GHG emissions in American Canyon represent travel that neither originates nor ends in the City and therefore should be considered as an element of the countywide and region-wide reduction effort.

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| American Canyon | 2005 Emissions (metric tons) | % Total 2005 Emissions | 2020 Emissions | % Increase 2005 to 2020 |
|---|---|---|---|---|
| Residential Buildings | 19,819 | 22% | 27,393 | 38% |
| Commercial & Industrial Buildings | 21,672 | 24% | 59,261 | 173% |
| Transportation | 40,479 | 44% | 50,672 | 25% |
| Lawn & Garden Equipment | 346 | 0% | 478 | 38% |
| Construction & Industrial/Commercial Equipment | 1,660 | 2% | 4,539 | 173% |
| Agriculture/Farming | 4 | 0% | 4 | 0% |
| Solid Waste | 7,469 | 8% | 10,046 | 35% |
| **TOTAL** | **91,449** | | 152,393 | 67% |

## Calistoga

Calistoga's communitywide emissions are expected to increase by a relatively small 11% by 2020. Also, given that 52% of Calistoga's current emissions are due to existing buildings, Calistoga's initial priority actions are to implement policies and programs that make these buildings more energy efficient and explore financing opportunities that make switching to renewable energy alternatives more attractive.

| Calistoga | 2005 Emissions (metric tons) | % Total 2005 Emissions | 2020 Emissions | % Increase 2005 to 2020 |
|---|---|---|---|---|
| Residential Buildings | 7,758 | 27% | 8,022 | 3% |
| Commercial & Industrial Buildings | 7,062 | 25% | 7,486 | 6% |
| Transportation | 8,704 | 31% | 10,896 | 25% |
| Lawn & Garden Equipment | 151 | 1% | 156 | 3% |
| Construction & Industrial/Commercial Equipment | 1,949 | 7% | 2,066 | 6% |
| Agriculture/Farming | 132 | 0% | 132 | 0% |
| Solid Waste | 2,671 | 9% | 2,722 | 2% |
| **TOTAL** | **28,427** | | 31,480 | 11% |

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## City of Napa

Emissions in the City of Napa are projected to increase 24% percent between 2005 and 2020, with the majority of emissions growth occurring due to growth in jobs in the commercial and industrial sectors, from 35,260 in 2005 to 42,280 in 2020.

Given that 49% of the City of Napa's current emissions are in the transportation sector, the City has focused its attention on both planning and policies that enhance urban-centered growth and encourage mixed use, live/work and "walkable"/"bikeable" neighborhoods. In addition, the City is seeking funding to improve the fuel efficiency of the public street system and developing parking strategies that reduce vehicle miles traveled. And, since building energy use represents 39% of the overall emissions, the City has adopted a green building ordinance and is working together with other jurisdictions in Napa County to provide attractive energy efficiency upgrade and renewable energy funding for property owners.

| City of Napa | 2005 Emissions (metric tons) | % Total 2005 Emissions | 2020 Emissions | % Increase 2005 to 2020 |
|---|---|---|---|---|
| Residential Buildings | 106,003 | 23% | 117,765 | 11% |
| Commercial & Industrial Buildings | 71,120 | 16% | 85,279 | 20% |
| Transportation | 221,901 | 49% | 277,777 | 25% |
| Lawn & Garden Equipment | 2,109 | 0% | 2,343 | 11% |
| Construction & Industrial/Commercial Equipment | 24,277 | 5% | 29,110 | 20% |
| Agriculture/Farming | 286 | 0% | 286 | 0% |
| Solid Waste | 29,366 | 6% | 32,011 | 9% |
| **TOTAL** | **455,062** | | 544,571 | 22% |

## St. Helena

St. Helena community GHG emissions are projected to increase only 8 percent by 2020, the smallest percentage increase in Napa County. Given the very small increase in projected growth and that 61% of the current emissions are from building energy use, St. Helena's focus is on implementing energy efficiency and renewable energy programs for existing residents and businesses.

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| St. Helena | 2005 Emissions (metric tons) | % Total 2005 Emissions | 2020 Emissions | % Increase 2005 to 2020 |
|---|---|---|---|---|
| Residential Buildings | 10,781 | 23% | 11,225 | 4% |
| Commercial & Industrial Buildings | 17,458 | 38% | 18,139 | 4% |
| Transportation | 8,452 | 18% | 10,580 | 25% |
| Lawn & Garden Equipment | 178 | 0% | 185 | 4% |
| Construction & Industrial/Commercial Equipment | 4,061 | 9% | 4,219 | 4% |
| Agriculture/Farming | 769 | 2% | 769 | 0% |
| Solid Waste | 4,353 | 9% | 4,424 | 2% |
| **TOTAL** | **46,052** | | 49,541 | 8% |

## Yountville

Yountville's GHG emissions are projected to increase by only 13 percent between 2005 and 2020. Given this relatively small growth in emissions from new development and the fact that 63% of the Town's emissions are from existing buildings, Yountville's climate action focus is on making existing buildings more energy efficient and encouraging and enabling renewable energy for existing buildings.

| Yountville | 2005 Emissions (metric tons) | % Total 2005 Emissions | 2020 Emissions | % Increase 2005 to 2020 |
|---|---|---|---|---|
| Residential Buildings | 3,765 | 13% | 4,288 | 14% |
| Commercial & Industrial Buildings | 14,032 | 50% | 15,019 | 7% |
| Transportation | 7,424 | 26% | 9,293 | 25% |
| Lawn & Garden Equipment | 79 | 0% | 90 | 14% |
| Construction & Industrial/Commercial Equipment | 1,858 | 7% | 1,989 | 7% |
| Agriculture/Farming | 38 | 0% | 38 | 0% |
| Solid Waste | 1,109 | 4% | 1,207 | 9% |
| **TOTAL** | **28,305** | | 31,924 | 13% |

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## Unincorporated Napa County

The unincorporated area of Napa County has a projected growth of 19% in GHG emissions, due mostly to the very high percentage of transportation emissions attributed to the unincorporated area of Napa County. Given that these emissions are the result of intracounty travel among all local jurisdictions as well as regional transportation planning challenges, Napa County is engaged in working together with NCTPA to find regional solutions while working locally to maintain and improve the County's overall jobs to housing balance.

| Unincorporated Napa County | 2005 Emissions (metric tons) | % Total 2005 Emissions | 2020 Emissions | % Increase 2005 to 2020 |
|---|---|---|---|---|
| Residential Buildings | 48,224 | 9% | 51,232 | 6% |
| Commercial & Industrial Buildings | 95,317 | 17% | 107,599[16] | 13% |
| Transportation | 349,764 | 63% | 437,836 | 25% |
| Lawn & Garden Equipment | 753 | 0% | 800 | 6% |
| Construction & Industrial/Commercial Equipment | 15,870 | 3% | 17,915 | 13% |
| Agriculture/Farming | 31,817 | 6% | 31,817[17] | 0% |
| Solid Waste | 9,241 | 2% | 9,790 | 6% |
| **TOTAL** | **550,986** | | 656,989 | 19% |

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[16] These figures do not account for emissions associated with the Napa Pipe development proposal expect to the extend that development on that site would replace development assumed to occur elsewhere

[17] These figures do not account for projected increase in vineyards development in the unincorporated county, estimated at 10,000 additional acres by 2030

# III. Policy Context for Local Climate Protection

## *The Climate Action Framework*

Local government has an enormously important role to play in the achieving the greater long-term goal of preventing catastrophic climate change. The Napa Countywide Community Climate Action Framework will support existing local values and visions as identified in existing jurisdiction policy documents.[18]Representative selections from local plans include:

### Promote Economic Sustainability

- Support a viable, thriving agricultural industry
- Promote locally-produced power
- Stimulate development of a specialized and skilled workforce (including energy services)
- Help businesses to conserve energy and renew resources
- Provide increased opportunities for multi-family and affordable workforce housing

### Promote Equal Access to Community Resources

- Support non-vehicle access to parks, schools, grocery stores and medical services
- Support a transportation system that enables compact development

### Promote Environmental Sustainability

- Promote efficient use of water, land, and energy resources
- Promote renewable resources as a primary energy source
- Encourage use of Transportation Demand Strategies
- Provide a system of safe, efficient and attractive bicycle and pedestrian routes for commuter, school and recreational use

### Adaptation to Changing Climate

- Adapt to changes in the climate that have already happened
- Reduce the impact of the changes that can be expected

The Framework will guide future implementation and foster effective collaboration between government, business and community organizations toward achieving the GHG reduction targets.

[18] Napa County General Plan (2008), St. Helena General Plan (2009), City of Napa General Plan (2009), Calistoga General Plan (2003), City of American Canyon General Plan (2006), Town of Yountville General Plan (2009).

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## General Plans

General Plans are composed of goals, objectives, policies, standards, and/or implementation measures, as well as a set of maps and diagrams that describe a vision for the community's future development. While renewable energy sources, cleaner fuels and green technology will help reduce GHG emissions, significant changes in how we design and construct our "built environment," as determined in General Plans, are also necessary.

GHG reduction policies can be incorporated into regional and local planning efforts, including each jurisdiction's General Plan. Policies can be incorporated into existing General Plan Elements (such as housing, land use, conservation, noise, circulation, open space, and safety). The way the different elements interrelate is an important consideration when incorporating policies for GHGs in the General Plan, and ensuring that those policies are internally consistent throughout the Plan. Alternatively, climate change can be added as an entirely separate element, which gives it additional importance. The recently updated Napa County General Plan contains numerous significant references to climate protection and GHG reduction goals. The St. Helena General Plan, currently under revision, is projected to contain an innovative stand-alone Climate Change Element.

## ICLEI—Local Governments for Sustainability

ICLEI has been a leader both internationally and domestically for more than ten years, representing over 770 local governments around the world. ICLEI was launched in the United States in 1995 and has grown to include more than 230 US cities and counties providing national leadership on climate protection and sustainable development. In June 2006, ICLEI launched the California Local Government Climate Task Force as a formal mechanism to provide ongoing input and collaboration into the State of California's climate action process. ICLEI also works in conjunction with the US Conference of Mayors to track progress and implementation of the US Mayors Climate Protection Agreement, launched in 2005, which more than 376 mayors have signed to date, pledging to meet or beat the Kyoto Protocol emissions reduction target in their own communities.

## Regional Efforts

To be effective, local planning efforts alternatives must be evaluated for consistency with regional plans. Four Bay Area agencies—the Bay Area Air Quality Management District, the Metropolitan Transportation Commission, the Association of Bay Area Governments, and the San Francisco Bay Conservation and Development Commission—have also formally made climate protection part of their agendas. Separately they are pursuing regulatory and incentive-based programs, and together through the Joint Policy Committee, chaired by Napa County Supervisor Bill Dodd, they are also forging a coordinated effort to reduce emissions throughout the region, particularly as related to transportation and land use policies.[19]

[19] See Appendix I: SB375 Carbon Reductions through Transportation and Land Use Planning.

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## *Statewide Policies*

### State Reduction Targets for GHGs (Executive Order S-3-05)

The first comprehensive state policy to address climate change was established through an Executive Order of the Governor of California. In 2005, Governor Schwarzenegger issued California Executive Order S-3-05, which established ambitious GHG reduction targets for the state: reduce GHG emissions to 2000 levels by 2010, reduce to 1990 levels by 2020, and reduce emissions 80% below 1990 levels by 2050. These targets reflect the world-wide emission reduction trajectory identified by the International Panel on Climate Change (IPCC) as being necessary to avert catastrophic global climate change. Under the Executive Order, each state agency is directed to identify and pursue actions within their purview that could contribute to the necessary emission reductions.

### Global Warming Actions Act of 2006 (AB 32)

California AB 32, the "Global Warming Actions Act of 2006," codifies the State's GHG emissions target by directing the California Air Resources Board (CARB) to reduce the State's global warming emissions to 1990 levels by 2020. CARB regulations must begin phasing in by 2012. AB 32 vests the principal authority to implement the program in the CARB, but provides that the Secretary of Cal/EPA will coordinate across state agencies. The cornerstone of the program is the development and adoption by CARB of a Scoping Plan that identifies specific reduction strategies, implementation mechanisms, and timelines. The CARB adopted the Scoping Plan in December of 2008, and regulations to implement the Plan's strategies are currently in development for implementation by 2012.

### Greenhouse Gas Emission Standards for Vehicles (AB 1493)

Passed in 2002, before the overarching climate program was established, AB 1493, authored by Assembly Member Fran Pavley and often referred to as "the Pavley Bill," required CARB to develop and adopt the nation's first GHG emission standards for automobiles, and the emission limits it requires are commonly referred to as the Pavley Standards. The CARB approved GHG emission limits for light duty vehicles in 2004. The standards become effective in 2009 and will reduce GHG emissions from California passenger vehicles by about 22 percent by 2012 and about 30 percent by 2016.

Although the federal government generally reserves the authority to establish tailpipe emission standards for motor vehicles, the federal Clean Air Act provides that California may establish such standards and the US EPA granted California the authority to implement GHG emission reduction standards for new passenger cars, pickup trucks and sport utility vehicles on June 30, 2009.

### Low Carbon Fuel Standard (Executive Order S-1-07)

In his January 2007 State of the State message, Governor Schwarzenegger established a Low Carbon Fuel Standard (LCFS) by Executive Order. This first-in-the-world greenhouse gas standard for transportation fuels will spark research in alternatives to oil and reduce GHG emissions. The LCFS calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020.

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## Renewable Energy Portfolio (SB 1078 and SB 107)

Established in 2002 under SB 1078 and accelerated in 2006 under SB 107, California's Renewable Portfolio Standard (RPS) obligates investor-owned utilities (IOUs), energy service providers (ESPs) and community choice aggregators (CCAs) to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010. CARB's Scoping Plan identifies a target RPS of 33% by 2020.

## Improved Land Use Planning (SB 375)[20]

In September 2008, the Governor signed Senate Bill 375. This bill has five main provisions.

1. Creation of regional targets for GHG emissions reduction tied to land use (and therefore driving patterns).
2. A requirement that regional planning agencies create a plan to meet those targets, even if that plan is in conflict with local plans.
3. A requirement that regional transportation funding decisions be consistent with this new plan.
4. Tethering together regional transportation planning and housing efforts for the first time.
5. New CEQA exemptions and streamlining for development projects that conform to the new regional plans, even if they conflict with local plans.

## Indirect Source Rule for CO2

The Bay Area Air Quality Management District (Air District) is initiating development of an Indirect Source Review Rule (ISR) to address the adverse impacts of growth on local and regional air quality as well as address the impacts of growth on our climate. Indirect sources are development projects that generate or attract motor vehicle trips and emissions and also include other sources of emissions, such as fireplaces, home heating and cooling, and landscape maintenance equipment, which indirectly cause air pollution. The Air District anticipates proposing an Indirect Source Review Rule for consideration by the District Board of Directors in 2010 and is also proposing to assess administrative and mitigation fees associated with its implementation.

## Alternative and Renewable Fuel & Vehicle Technology Program (AB 118)

In October 2007, Governor Schwarzenegger signed AB 118 into law. AB 118 provides approximately $200 million annually through 2015 for three new programs to fund air quality improvement projects and develop and deploy technology and alternative and renewable fuels. The bill creates a dedicated revenue stream for the programs via increases to the smog abatement, vehicle registration and vessel registration fees. The three new programs are: the Air Quality Improvement Program administered by CARB, the Alternative and Renewable Fuel and Vehicle Technology Program administered by the California Energy Commission, and the Enhanced Fleet Modernization Program administered by the Bureau of Automotive Repair.

[20] See Appendix I: SB375 Carbon Reductions through Transportation and Land Use Planning.

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## California Energy Efficiency Standards (Title 24, Chapter 6)

Title 24, Part 6 (California's Energy Efficiency Standards for Residential and Nonresidential Buildings) of the California Code of Regulations was first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and incorporation of new energy efficiency technologies and methods. These standards are mandatory and thus new building permitted by City and County governments must comply with the standards in effect at the time. These standards also promote cost-effective means to reduce energy use and thus GHG emissions for new development relative to business-as-usual conditions.

The Energy Commission adopted the 2008 Standards in April 2008, and became effective in August 2009.

## California Environmental Quality Act

The California Environmental Quality Act (CEQA) is not specific to GHG regulation and does not create specific new mandates for General Plans; however, its basic goal is to ensure that environmental impacts of proposed projects are evaluated, and significant impacts are mitigated and disclosed to the public.

CEQA substantially influences the approval process for General Plans. The evaluation is done through an Environmental Impact Report (EIR) which provides State and local agencies and the general public with detailed information on potentially significant environmental impacts a proposed project is likely to have and ways to mitigate those impacts, and also information on how to evaluate potential alternatives to the project.

On January 1, 2010, the California Natural Resources Agency is expected to approve a series of amendments to the CEQA Guidelines. The proposed amendments contain recommended changes to fourteen sections of the existing guidelines, including: the determination of significance as well as thresholds; statements of overriding consideration; mitigation; cumulative impacts; and specific streamlining approaches.

The amended Guidelines require local agencies to quantify or describe the greenhouse gas (GHG) emissions of proposed projects and to mitigate GHG emissions when feasible. The Guidelines emphasize the importance of local greenhouse gas reduction plans (such as local climate action plans) as a means for both providing and streamlining CEQA review for projects. An agency may find a project's impact due to GHG less than significant if the project is consistent with a local climate action plan.

## California Climate Adaptation Strategy

The State Department of Resources is finalizing a comprehensive plan to guide adaptation to climate change, recognizing that "climate change is already affecting California." The document summarizes the latest science on how climate change could impact the state, and provides recommendations on how to manage against those threats in seven sector areas.

Regionally, The Bay Conservation and Development Commission (BCDC) has released initial studies that will lead to an adaptation plan that includes a strategy for adapting to sea level rise in San Francisco Bay and the Suisun Marsh over the next 50 years.

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## National

As part of the national policy debate on climate change, the American Clean Energy and Security Act of 2009 was narrowly passed by the House of Representatives in June of this year. Also known as the Waxman-Markley comprehensive energy bill, it includes a cap-and-trade global warming reduction plan designed to reduce economy-wide greenhouse gas emissions by 17 percent by 2020. Other provisions include new renewable requirements for utilities, studies and incentives regarding new carbon capture and sequestration technologies, energy efficiency incentives for homes and buildings, and grants for green jobs, among other things.

Also in June of this year (2009) the US Government released its "Global Climate Change Impacts in the United States," compiling years of scientific research and new data not available in previous large national and global assessments. It was produced by a consortium of experts from 13 US government science agencies and from several major universities and research institutes. Its production and review spanned both Republican and Democratic administrations.

Some key findings include:

- **Climate changes are underway in the United States and are projected to grow.** Climate-related changes are already observed in the United States and its coastal waters. These include increases in heavy downpours, rising temperature and sea level, rapidly retreating glaciers, thawing permafrost, lengthening growing seasons, lengthening ice-free seasons in the ocean and on lakes and rivers, earlier snowmelt, and alterations in river flows. These changes are projected to grow.
- **Crop and livestock production will be increasingly challenged.** Agriculture is considered one of the sectors most adaptable to changes in climate. However, increased heat, pests, water stress, diseases, and weather extremes will pose adaptation challenges for crop and livestock production.
- **Threats to human health will increase.** Health impacts of climate change are related to heat stress, waterborne diseases, poor air quality, extreme weather events, and diseases transmitted by insects and rodents. Robust public health infrastructure can reduce the potential for negative impacts.

## Global

As of the drafting of this report, world leaders are preparing to gather in Copenhagen this December to update the previous world accord on climate change, the "Kyoto Protocol" drafted in 1997. To date 184 countries have ratified the Kyoto agreement, representing over 63.9% of 1990 emissions. The most notable non-party to the Protocol is the United States, which was responsible for 36% of the global 1990 emission levels from industrial nations. The reductions for the US under the protocol were 7% below 1990, significantly less onerous than the reductions currently under consideration (up to 80% below 1990 levels according to California targets). Following preparatory talks in Bonn, Bangkok and Barcelona, the Copenhagen conference is expected to adopt the treaty succeeding the Kyoto Protocol.

The most recent international assessment of climate change caused by human activity, released in 2007, is the "Fourth Assessment" of the International Panel on Climate Change (IPCC), a scientific intergovernmental body tasked to evaluate the risk of climate change. The Fourth

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Assessment was produced by over 600 authors from 40 countries. Although the report is highly detailed and technical, its principal conclusions were that:

- Warming of the climate system is unequivocal. World temperatures could rise by between 2 and 11.5 ° during the 21st century; and
- Most of the observed increase in global average temperatures since the mid-20th century is very likely (with over 90% certainty) due to the observed increase in anthropogenic greenhouse gas concentrations.

The "Fifth Assessment" is currently under preparation and is due in 2014.

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# IV. Six Goals and 53 Actions for GHG Reductions

To reach the 2020 reduction target, the cities and the County of Napa will need to reduce GHG emissions countywide by 30 percent by 2020.

To achieve that 2020 target, Napa County must aggressively pursue reduction measures in every sector. For example, the transportation sector produces the greatest amount of Napa County's GHG emissions—approximately 55 percent. Ideally, emissions reduction strategies would yield the greatest results in this area. However, transportation is the sector least amenable to reduction actions, as discussed below. Thus to the extent that reductions are proportionally less in transportation due to the lack of available measures, short term *high-impact* opportunities in the electricity and natural gas sector must be pursued to compensate for transportation's shortfall, despite the fact that only about 36 percent of GHG emissions in Napa County come from electricity/natural gas. In the long term, reductions from all sectors will have to approach 80 percent by 2050 to meet the scientific imperative.

This document details six goals with 53 high-priority countywide actions intended to achieve the emissions goals. Staff from all Napa cities/towns and County participated in the drafting of the 53 countywide numbered actions outlined below. In addition, when appropriate, each jurisdiction provided additional local specificity regarding the development or implementation of a countywide action.

The Climate Action Framework's actions fall into six major goals:

1. **Expand Transportation and Mobility Options – 15 Actions:** Shift transportation from fossil fuel vehicles to transit, walking, bicycling, and renewably powered vehicles and invest in Napa County jobs.
2. **Improve Buildings and Energy Efficiencies – 7 Actions:** Invest in widespread energy and water efficiency to reduce demand; invest in Napa County renewable energy sources.
3. **Reduce Consumption and Solid Waste – 6 Actions:** Significantly reduce the amount of waste produced in cities and the County.
4. **Conserve Agriculture, Natural Resources, and Urban Forests – 9 Actions:** Protect our natural resources and farmland, and sequester carbon.
5. **Increase Community Engagement – 7 Actions:** Market programs and conduct community outreach to increase participation in GHG reduction efforts.
6. **Improve Local Government Operations – 9 Actions:** Lead by example by implementing policies and programs in jurisdiction operations and facilities.

The actions described in this Framework are not intended to be an exhaustive list of actions that the cities and County of Napa will undertake to achieve the 2020 objectives; they may do much more. However, these actions identified are the highest priority countywide actions. The Climate Action Framework includes goals for 2020, objectives and the actions needed to achieve these objectives. When implemented, these actions will enable the County and cities to meet the established emissions target.

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## Goal 1. Expand Transportation and Mobility Options (TM)

GHG emissions related to transportation account for 53% of the total countywide emissions and are the fastest growing source of GHG emissions in Napa County.

Nearly two out of three trips[21] made in Napa County are by single occupant, fossil fuel powered automobiles. Approximately $150 million[22] leaves the County per year as payment for the fossil fuel that powers our vehicles. Given population growth projections, by 2020 the amount of dollars leaving the County for fossil vehicle fuel will rise by almost 30 percent—more if fuel cost increases are added.

Napa County's transportation and land use patterns function as an integrated countywide system—no actions in a single jurisdiction can adequately address the target reduction. Thus effective transportation actions will require both cooperative action among all Napa jurisdictions and strategic planning in cooperation with our neighboring counties.

Broadly, there are three main ways to reduce GHG emissions from the transportation sector:

1. Implement policies that reduce dependence on personal motor vehicles and encourage alternative modes of transportation, such as public transit, car and van pooling, cycling, and walking.
2. Use vehicles that release fewer greenhouse gases, such as hybrids, more fuel-efficient vehicles and vehicles that run on alternative fuels.
3. Encourage 'smart growth' policies that promote efficient land use development. Smart growth reduces the need to travel long distances, facilitates transit and other non-automotive travel, increases the availability of affordable housing, employs existing infrastructure capacity, promotes social equity, helps protect natural assets, and maintains and reinforces existing communities.

Achieving even a 15 percent GHG reduction by 2020 in the Bay Area's transportation sector will be very difficult, according to transportation modeling and forecasts from regional agencies. Initial results of the modeling done for strategies in the Draft NCTPA Strategic Transportation Plan echo these findings. Napa County scenarios, which include bold and dramatic land use policy changes, do not quickly produce significant GHG reductions. The reasons appear to be that local land use changes don't significantly alter traffic patterns originating from Solano and Sonoma Counties and that much of Napa County's infrastructure is unalterable, at least in the short term.

Transportation and land use patterns are tightly linked. Building new roads can lead to sprawl, which leads to more development farther away from urban centers. Through transit-oriented development policies, new or intensified development can be channeled to urban centers. As urban centers become more densely populated, transit, walking and biking become more attractive and can successfully displace auto travel. Conversely, lower, more spread-out population density leads to an overall per capita increase in personal automobile use. A recent study showed that the further residents live from city centers, the more driving they do. In contrast, other cities have demonstrated that aggressive and early management of land use and

[21]Metropolitan Transportation Commission: Travel Forecasts Data Summary, Transportation 2035 Plan for the San Francisco Bay Area, December 2008.
[22] Based on 60 million gallons total fuel sales, at an average of $2.50 per gallon (Caltrans).

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transportation can lead to success in reducing a community's GHG emissions due to personal auto use.

**"Napa's Transportation Future" Strategic Plan**
"Napa's Transportation Future," a countywide strategic transportation plan adopted by the Napa County Transportation and Planning Agency, outlines a compelling vision and set of goals, principles and challenges that are directly aligned with the goal of reducing transportation emissions. Directly relevant goals and objectives (to be met by 2035) include:

**Goal:** Reduce/restrain growth of automobile vehicle miles traveled (VMT)
*Objective: 0 percent net growth in aggregate VMT*

**Goal:** Shift travel from Single-Occupancy Vehicles to other modes
*Objective: Increase the percent of county trips made by transit to 5%*
*Objective: Increase the percent of county trips made by bicycle to 10%*
*Objective: increase the percent of county trips made by walking to 10%*

**Goal:** Reduce overall energy use and greenhouse gas (GHG) emissions
*Objective: Reduce GHG emissions from all transportation modes in Napa County to 40% below 1990 levels*

For the purpose of measuring GHG emissions reductions, these goals and objectives were modeled based on whether they reduced the overall demand for fossil fuel or encouraged the switch to renewable energy powered vehicles.

The chart below shows that an anticipated 3.3% reduction in total transportation sector emissions can be achieved by increasing the number of trips using transit, walking or biking. A 2.1% reduction can be achieved from actions that slow down the growth rate of new VMT, such as land use policies that focus new growth in urban centers or near convenient transit and housing policies that result in affordable housing built near major employment centers or transit. Taken together, these measures result in a 5.3% reduction in emissions from the business as usual (65,000 tons/year below BAU). This overall reduction in transportation emissions equals 15% of the target reduction goal.

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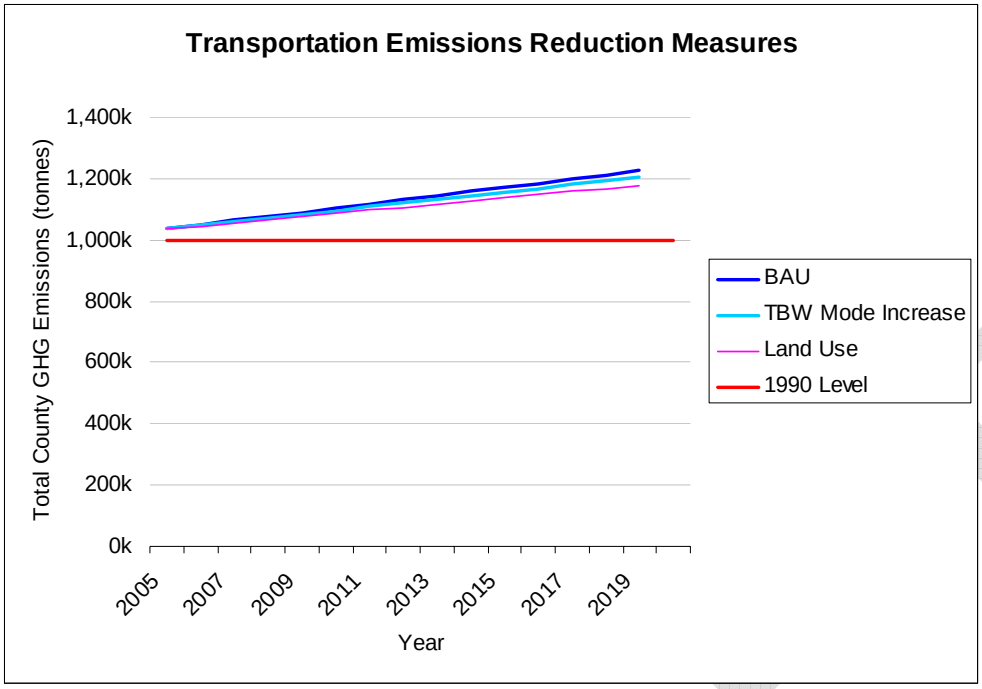


*BAU = Business as Usual; TBW= Transit, Bike, Walk

In June 2009, the US EPA granted a waiver to California to enable implementation of Assembly Bill 1493 (called the California Clean Cars Law or the Pavley Bill, passed in 2002). This law requires that, beginning with the 2009 model year, non-commercial vehicles sold in the state of California must reduce tailpipe emissions of greenhouse gases by 30% over an eight year phase-in period. Implementing this law will result in an estimated 18% reduction in total "business as usual emissions" from the California light duty fleet by 2020, and a 30 percent reduction by 2030. The effect of this law on vehicle emissions from the overall fleet is shown in the chart below.[23] Due to growth in the fleet, this regulation will serve to keep growth in total emissions from the fleet relatively flat. However, absent new regulation or other changes, emissions will start to rise again starting in about 2025.

## OBJECTIVE TM1: Reduce demand for fossil fuel by decreasing vehicle miles traveled.

The actions described below will reduce vehicle miles traveled by:

- Slowing down the anticipated growth rate of new vehicle miles traveled by implementing compact growth policies;
- Increasing the number of people using transit, walking or biking;
- Reducing the average length of trips and increasing the efficiency of transportation system; and
- Reducing the total number of trips.

[23] Chart from California Clean Cars Campaign Fact Sheet.

### Slowing down the anticipated growth rate of new vehicle miles traveled

Land use policies reduce the growth in new vehicle miles traveled and have many community and quality of life benefits. The emissions reduction resulting from these policies is difficult to measure; however, in August 2009, the Transportation Review Board published a study that shows how "more compact, mixed-use development can produce reductions in energy consumption and CO2 emissions both directly and indirectly."[24] Based on the findings in this report, it is estimated that these countywide land use actions can result in upwards of a 15 percent reduction in the growth rate of vehicle miles traveled from business as usual estimates.

By 2020, the goal is to increase the number of trips that use transit from 1.5% to 2.9%, those that use bicycles from 2.2% to 5.3%, and those that entail walking from 5.8% to 7.5%. Overall, this goal means over 15% of all of the trips in Napa County will use public transit, bicycles or walking.

***ACTION TM1.1: Enhance our commitment to urban-centered growth, adopting policies, zoning, and design standards in each jurisdiction to encourage mixed-use, live/work, and "walkable" and "bikeable" neighborhoods.***

***ACTION TM1.2: Maintain or improve the County's overall "balance" of 70,690 jobs and 64,100 employed residents (ratio of 1.1 to 1) through land use policies and decisions that locate jobs and wage-appropriate housing in proximity to each other.***

***ACTION TM1.3: Require discretionary development projects to assess and mitigate the impacts of vehicle miles traveled through transportation demand management programs including providing transit amenities.***

***ACTION TM1.4: Evaluate truck and freight rail routes and, based on these findings, develop policies and strategies that improve circulation and address neighborhood compatibility issues.***

***ACTION TM1.5: Adopt and implement the NCTPA Strategic Transportation Plan to increase transit service and ridership throughout Napa County.***

### Increasing the number of people using transit, walking or biking

"Napa's Transportation Future" places strong emphasis on providing alternative choices to single occupancy vehicles. Specifically, this Plan calls for significantly increasing the percentage of trips that use transit or bicycles or walk.

***ACTION TM1.6: Complete a multi-use countywide Class 1 trail from Calistoga to American Canyon (also known as the Napa Valley Vine Trail), and adopt and implement pedestrian and bicycle networks within each city and town that connect to it.***

[24] Transportation Review Board: "Driving and the Built Environment: The Effects of Compact Development on Motorized Travel, Energy Use, and CO2 Emissions."

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***ACTION TM1.7: Maintain and enhance existing express bus, local bus, and paratransit services, establish a northbound upvalley express bus during peak commute hours, and complete construction of a major transit center in central Napa.***

***ACTION TM1.8: Expand Park and Ride areas and other support facilities to encourage public transportation use and car and van pooling.***

***ACTION TM1.9: Study rail and bus rapid transit options in the Highway 29 corridor between Vallejo and downtown Napa, and in the Highway 12 corridor between Fairfield and central Napa. Plan for the phased implementation of transit improvements with the goal of bus rapid transit between Vallejo ferry and the Fairfield and central Napa transit centers.***

***ACTION TM1.10: Implement programs that encourage car-free tourism such as zero emission shuttle services during peak weekends and special events.***

### Improving the overall fuel efficiency of the transportation system

In general, the reductions in emissions from local measures that improve overall fuel efficiency are small compared to the expected reduction from increases in fuel efficiency resulting from increasing the fuel efficiency of cars and light trucks[25]. However, these local measures are important, because they can be implemented relatively quickly and at a low cost, whereas the emissions reduction from increases to fuel effciency standards is not under local control and takes up to 15 years to make a difference.

Overall, these local measures will result in an estimated 0.4% reduction in transportation sector emissions for each 1% improvement in fuel efficiency. An improvement of this sort might be achieved, for example, by a 1% reduction in time spent idling at stoplights.

***ACTION TM1.11: Improve the fuel efficiency of the public street system by optimizing signal timing on arterials, improving street connections and reducing circuitous routes.***

### Reducing the average length of trips

Each 1% of average trip length reduction will reduce transportation sector emissions by 0.1%. There are also several significant co-benefits from this action including additional local jobs, more robust local economy, and a healthier community.

***ACTION TM1.12: To reduce vehicle miles, adopt policies and ordinance changes that facilitate working at home, and support local hiring, food production, farmers markets, and community-based "buy local" campaigns. (See also AN1 and AN4.)***

### Reducing the total number of trips

One method of reducing the total number of trips taken by single occupant vehicles is to adopt transportation demand pricing policies. These policies help ensure that private vehicle use pays

[25] The U.S. EPA recently granted California the authority to implement the California Clean Car Law or Pavley Law (AB 1493). Amendments to harmonize California and federal vehicle fuel efficiency standards are underway, http://www.arb.ca.gov/cc/ccms/ccms.htm.

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its fair share by reflecting the true cost of automobile use to the community. For example, road use charges (various direct charges applied to those using roads, including fuel taxes, license fees, parking taxes, tolls, and congestion charges, which may vary by time of day, by the specific road, or by the specific vehicle type, being used) and parking fees (requiring users of parking to pay the costs directly, as opposed to sharing the costs indirectly with others through increased rents and tax subsidies) reflect a full-cost pricing approach. Other methods of trip reduction include increasing telecommuting.

***ACTION TM1.13: Develop parking strategies in downtown areas to help reduce vehicle miles traveled.***

***ACTION TM1.14: Implement transportation demand reduction (TDM).***[26]

## Objective 2: Encourage and support the switch from fossil-fuel powered vehicles to renewable energy powered vehicles.

The American transportation system is highly automobile-centric. Our communities are built around the use of the automobile for personal transportation. It will be a long time before the beneficial effects of building new walkable, car-less communities are fully realized. As attractive as the vision of a car-less society may be from the viewpoint of GHG emissions reduction, it is a remote vision. Thus, the personal vehicle is almost inextricably enmeshed in the American lifestyle for the next several decades.

Potential policies and programs that help businesses and organizations with fossil-fuel powered fleet vehicles switch to vehicles powered by clean, renewable energy sources include:

- Deploy electric vehicle fleet using infrastructure developed in cooperation between the local energy authority and a private EV fleet operator.
- Implement vehicle-to-grid communications and control systems that are designed to exchange data with the electric grid, to help recharge the onboard battery pack without strain on the electric grid, and potentially to serve as an energy storage system for the electric grid. The system will reflect the battery storage requirements of the renewable portfolio.
- Encourage a large enough number of vehicle replacements countywide to reduce fossil-powered automobile trips by an additional 10 percent.

Given that the scientific imperative to significantly reduce GHG emissions has some urgency, American communities must also explore planning to expedite the deployment of non-fossil fuel powered vehicles. The drawbacks to these alternatives, primarily electric vehicles, are both cost and practicality. Therefore, this Climate Action Framework has identified several potential avenues for dramatically decreasing the cost and increasing the practicality of electric vehicles.

Electric vehicles substitute stored electricity for fossil fuel to provide motive power. However, electricity can also give rise to GHG emissions, depending on how it is generated. The majority of the cost of electric vehicles lies in the batteries. It is possible for local governments to include vehicle batteries and charging stations as part of a public power portfolio, since vehicle batteries can be used to augment the grid energy storage capacity required for renewables.

[26] TDM Encyclopedia. Victoria Transportation Policy Institute. www.vtpi.org.

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***ACTION TM2.1: Adopt consistent policies and programs that help businesses and organizations with fossil-fuel powered fleet vehicles switch to vehicles powered by clean, renewable energy sources. (See also LG1.)***

## Emissions Reduction Summary – Increase Transportation and Mobility Options

| Objectives | Implementer | Feasibility | Potential Metric Tons GHG Reduced | Estimated Investment | Investment per Metric Ton GHG Reduced |
|---|---|---|---|---|---|
| Objective TM1 Reduce demand for fossil fuel by decreasing vehicle miles traveled | | | | | |
| Slowing down the anticipated growth rate of new vehicle miles traveled *(Actions TM1.1, TM1.2, TM1.3, TM1.4, TM1.5)* | All Jurisdictions, NCTPA | Moderate | 25,000 or 6% of total target reduction | Nominal – these are mostly planning actions and regulatory changes | Nominal |
| Increasing the number of people using transit, walking or biking*(Actions TM1.5, TM1.6, TM1.7, TM1.8, TM1.9, TM1.10)* | All Jurisdictions, NCTPA | Challenging | 40,000 or 9% of total target reductions | Expand Bus service: $10M<br>VineTrail: $32-48M<br>Park and Ride Lots: $3M<br>Tourist Shuttles: unknown | $1,125 to $1,525 per ton of GHG reduced |
| Improving the overall fuel efficiency of the transportation system (Action TM1.11) | All Jurisdictions, NCTPA, EPA and CARB | Easy (reductions due mostly to CA Clean Car Law) | 80,000 or 18% of target reduction | Improved traffic signalization and flow: $1M | (efficiency improvements due to traffic signalization alone not determined) |
| Reduce length of trips (Action TM 1.12 | All Jurisdictions, NCTPA | Moderate | Difficult to quantify | Nominal – these are predominantly planning actions and regulatory changes | Nominal |
| Reduce # of trips (actions TM 1.13,TM 1.14) | All Jurisdictions, NCTPA | Moderate | Difficult to quantify | Nominal – these are predominantly planning actions and regulatory changes | Nominal |
| Objective TM2 Encourage and support the switch from fossil-fuel powered vehicles to renewable energy powered vehicles. | | | | | |
| ACTION TM2.1: Adopt consistent policies and programs that help businesses and organizations with fossil-fuel powered fleet vehicles switch to vehicles powered by clean, renewable energy sources. (See also LG1.) | All Jurisdictions, NCTPA | Moderate | To be determined | Nominal – these are predominantly planning actions and regulatory changes | Nominal |

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## *Goal 2. Improve Buildings and Energy Efficiencies (BE)*

### Buildings

This section addresses electricity and natural gas usage in Napa County and looks at the impacts of efficiency, existing buildings, new construction, water and wastewater on electricity and natural gas usage.

Given Napa County's overall 2020 reduction target of 31 percent, it would be necessary to reduce GHG emissions in the built environment by upwards of 60 percent, a highly ambitious target.

Energy efficiency improvement, especially in building shells, consistently shows itself to be the most cost-effective means of reducing emissions. However, the typical GHG reductions resulting from efficiency improvements are still small relative to their potential and the AB 32 target. The primary reason for this is that historically, homeowners and businesses have been slow to invest in energy efficiency measures. Nonetheless, there is reason to believe that proper program design—including subsidized pricing and "opt-out" rather than "opt-in" strategies—might help overcome some of these limitations and would represent upwards of 10% of the total emissions reduction needed.

Although renewable energy supply actions, in particular, individual actions such as rooftop solar PV, are often heralded as being the answer for GHG reduction, the recommended approach comprises a complete "low carbon" portfolio for grid electricity supply. This approach carries considerable challenges, both economically and relative to the current laws and regulation governing electricity distribution in California. However, it may be an effective way to achieve the lowest possible cost of electricity while reducing the carbon footprint of the electricity supply. This approach is based on the local availability of renewable resources closely matched to local demand. In addition, this approach treats efficiency measures and demand reduction techniques as creating "virtual capacity" that lowers the cost of implementing renewable energy actions. Given the capital intensive nature of renewable energy, financing becomes the major factor that determines the cost of renewable energy. Thus, financial instruments and scenarios are included as part of the renewable energy portfolio design.

Reducing the carbon emissions from building energy use requires two changes:

1. Improve energy efficiency to reduce energy consumed.
2. Reduce the carbon intensity of energy supplies, primarily by increasing renewable sources of electricity such as solar and geothermal power, as well as replacement of natural gas water and space heating systems with heat pump and solar technology.

Analyses explained in the following pages illustrate that switching to renewable energy sources for buildings is a key tool to achieve overall countywide emissions reductions.

Buildings are the single largest contributor to carbon emissions in all of the towns and cities of Napa County, except for the City of Napa. Overall, buildings in Napa County account for 36% of all of the carbon equivalent emissions in Napa County (423,011 of the 1,200,281 metric tons of CO2 equivalent emissions).

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| | GHG Emissions | | | |
|---|---|---|---|---|
| | Residential Buildings | Commercial Buildings | All Buildings | % of Total County |
| American Canyon | 19,819 | 21,672 | 41,491 | 10% |
| Calistoga | 7,758 | 7,062 | 14,820 | 4% |
| City of Napa | 106,003 | 71,120 | 177,123 | 42% |
| St Helena | 10,781 | 17,458 | 28,239 | 7% |
| Yountville | 3,765 | 14,032 | 17,797 | 4% |
| Unincorporated | 48,224 | 95,317 | 143,541 | 34% |
| Total Napa County | 196,350 | 226,661 | 423,011 | |

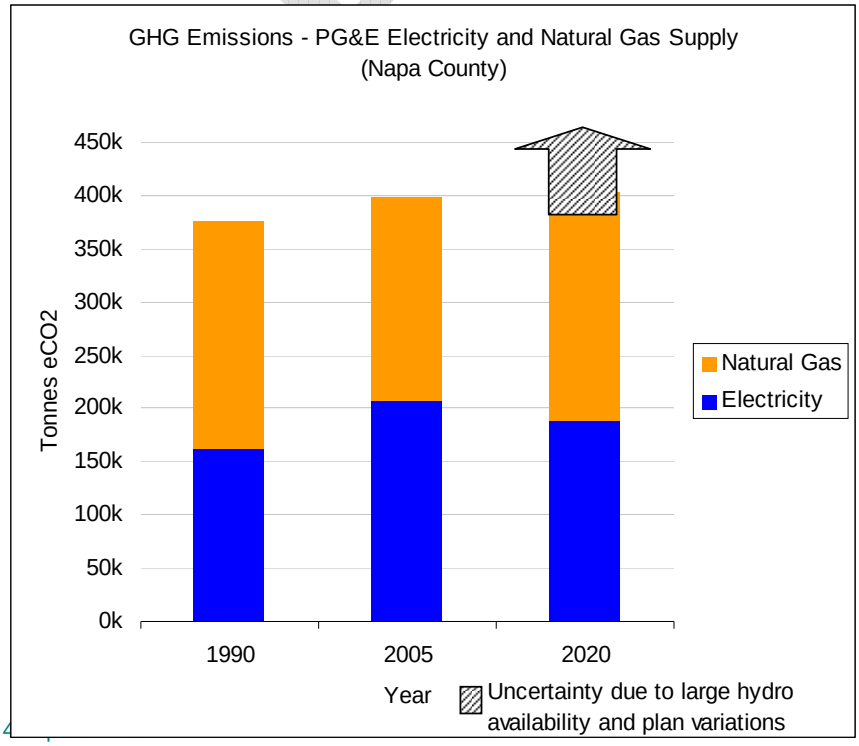
Because buildings last for many decades, efforts to reduce emissions from buildings need to address both existing structures and new construction. Given that the vast majority of the building stock that will exist in 2020 already exists today, the primary actions to reduce carbon emissions from building energy use are those that improve the energy efficiency of existing buildings.

## Energy Efficiency and Water

The water and wastewater systems are the largest single users of electricity in Napa County. Based on results obtained in Sonoma County, efficiency improvements in water system pumping and wastewater operations can be cost-effective. However, municipal operations in total account for 2 percent or less of total emissions from the County.

## Natural Gas and Propane

Findings reveal that Napa County's GHG from electricity from PG&E are projected to decrease while emissions from natural gas will actually increase.

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Although not included in the community-wide GHG inventory, propane combustion in the county may constitute a significant emissions source.[27] The majority of emissions occur due to the same end uses as natural gas in the residential and commercial sectors. Thus the measures described above for emissions reduction in the natural gas sector can be applied to emissions due to propane use.

## Objective BE1: Reduce energy demand through conservation and efficiency.

The actions described below will reduce the use of electricity and natural gas in existing and new buildings by:

- Improving the efficiency of existing buildings
- Reducing the anticipated growth of energy use in new buildings

### Improving the efficiency of existing buildings

Improving efficiency rightfully receives much attention because it is the most cost-effective approach for reducing GHG emissions. Reduction in energy demand has the same effect on total GHG reduction as replacing GHG-emitting energy sources with non-emitting sources. Thus, an efficiency retrofit of existing buildings that lowers energy consumption can have the same benefit as building windmills or installing solar panels.

Despite California's national leadership in energy-efficiency, there is a considerable gap between current per capita energy consumption and what is technically or economically feasible.

Through the energy efficiency study conducted for this Framework, it was confirmed that the current energy efficiency upgrade delivery programs in California fall far short of achieving all the potential efficiency improvements.[28] Methods for overcoming economic barriers to adoption of efficiency measures include energy-efficiency policies that are based on a sound understanding of the market problems they seek to correct and a realistic assessment of their likely effectiveness.

To be on track to reach the 2020 emissions target, and assuming that building energy savings will comprise 67 percent of the projected reductions, extensive building energy efficiency measures must be taken. Furthermore, since a large majority of the building energy use in the year 2020 will be from existing buildings, extensive energy-saving retrofit measures are necessary.

The effect of the various levels of efficiency improvement for both natural gas and electricity end uses in the residential and commercial sectors are shown below. There are two observations regarding the effect of efficiency that can be made:

- Efficiency creates the greatest reduction at the lowest cost, if implemented at the highest possible level.

[27] Data on propane use in Napa County was obtained from the Western Propane Gas Association.
[28] Analysis can be found at "High Performance Efficiency" online link under Technical Source Material at http://coolplan.org/ccap-report/source-material/source-material-toc.php

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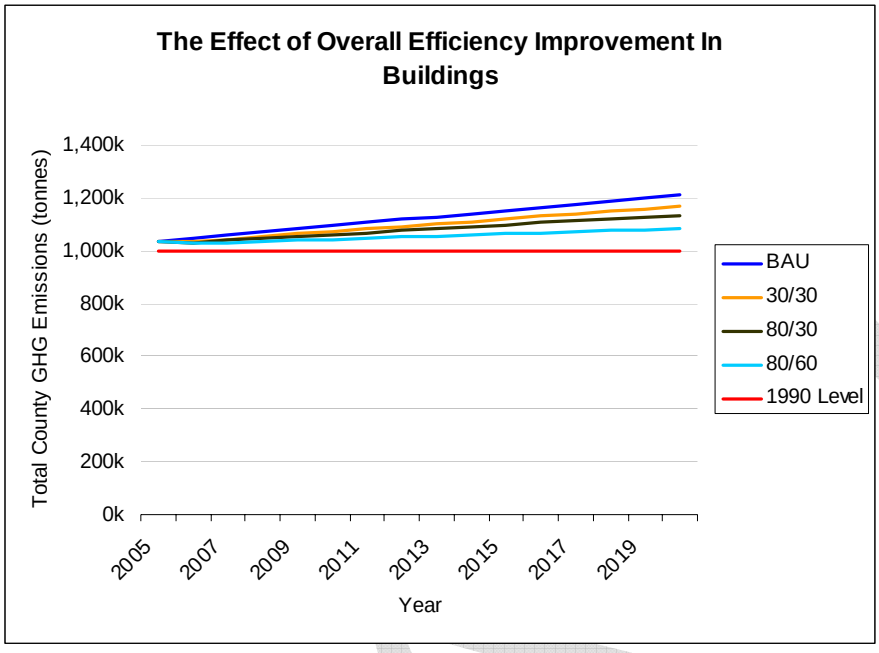
- By itself, efficiency improvements in existing buildings, even at very high levels compared to historical performance of utility-run programs, is *not sufficient* to return emissions to 1990 levels.




30/30 = 30% of residential households performing retrofits with average of 30% efficiency improvement; 80/30 = 80% of residential households performing retrofits with average of 30% efficiency improvement; 80/60 = 80% of residential households performing retrofits with average of 60% efficiency improvement .

Efficiency retrofits are cost-effective when the annual energy savings is greater than or equal to the annual payment on the financed amount. For the residential sector, cost effectiveness was assessed using a seven percent interest rate, financed over 20 years. Total program cost assumes 80 percent uptake rate (this means 40,000 of the 50,000 total Napa households perform energy efficiency retrofits). Using these financing terms, the annual payment per household for these efficiency measures is likely to be less than or equal to the savings from lower energy bills.[29]

[29] For the full cost and uptake analysis for a Napa County energy efficiency program, such as an AB 811 type program, see Appendix E: Implementing an AB 811 Program in Napa County.

**Electricity Efficiency Retrofit**

For residential customers, the most effective electricity efficiency upgrades include:

- Refrigerators
- Air conditioning (central and room)
- Space heating
- Water heating
- Lighting
- Clothes dryers
- Freezers
- Dishwashers

**Natural Gas Efficiency Retrofits**

Highly effective efficiency upgrades include:

- Additional attic insulation
- Building leakage testing and sealing
- Duct sealing
- Programmable thermostat
- High efficiency (95%) furnace

Note: Permanently installed items qualify for AB 811 financing (see Appendix E). For the above list, central air conditioning, electric furnaces or baseboard heat, electric water heaters and any permanently installed lighting would qualify.

The Napa countywide actions that will reduce electricity and natural gas use in existing buildings include:

***ACTION BE1.1: Implement an AB 811 program, making funding available to residential and commercial property owners seeking to improve their properties to conserve energy and water, and to generate renewable energy.***

***ACTION BE1.2: Pursue State and Federal funding programs designed to reduce energy demand through conservation and efficiency.***

***ACTION BE1.3: Require or request discretionary development projects to assess greenhouse gas emissions due to energy use, and to incorporate energy and water conservation measures into projects***

### Reducing the Growth of Electricity and Natural Gas Use

Every new building, no matter how energy efficient it is, will still add to emissions if it uses natural gas or grid electricity or if it increases fossil fuel-powered transportation. Clearly, a means to mitigate all new construction in Napa County so that it is at least "carbon neutral" must be developed. Installing energy generation—solar, wind, or other renewable source of power—as part of the building is one way to zero out the GHG emissions from the building. Another is offsetting energy consumption attributable to the building by reducing GHG emissions elsewhere.

The promotion of energy efficiency programs, as well, can contribute to reductions in building electricity and natural gas use. Utilities and other program implementers promote brands and incentive programs to consumers to encourage them to buy efficient appliances like Energy Star or upgrade the efficiency of their buildings and homes. Tax rebates help offset the cost of solar systems for property owners. The effectiveness of energy, water, and wastewater efficiency programs is limited by the number of customers that "opt-in" or "buy" the program. It is left to the customer to make a decision, arrange the financing, and have the work done.

The rate of penetration of such programs depends largely on the effectiveness of their marketing. Even though the program may make financial sense, the number of customers who actually implement efficiency measures has been relatively small compared with the level required to meet GHG emission reduction goals.

## Green Building Ordinances

The following strategies could reduce the growth rate of emissions below the forecast business as usual growth rate:

- Institute a mandatory green building ordinance throughout Napa County that covers all new residential and commercial construction, all commercial tenant improvements, and residential additions greater than a certain square footage (Rohnert Park provides a green building ordinance example)[30]
- Remove barriers to green building

For Napa County, the growth rate of electricity and natural gas can be reduced by enacting an ordinance that requires an additional 15 percent reduction below state-mandated Title 24 standards. This would result in an additional 1 percent reduction below business as usual emissions in 2020.

To the extent that water end use efficiency can be implemented, reductions in system flow can produce a greater reduction in energy use by water and wastewater systems than efficiency improvements. This is particularly true for increasing the efficiency of residential hot water end use. There is a "multiplier effect" if less hot water is used due to the overall decrease in the amount of energy used to transport, heat and process the water.

***ACTION BE1.4: Implement improved energy conservation (Title 24) standards for new buildings starting in January 2010, and before 2011 adopt enhanced green building ordinances that meet or exceed the 2010 California Green Building Standards.***

[30] City of Rohnert Park, Green Building Ordinance, July 2007.

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***ACTION BE1.5: Adopt policies and ordinance changes to reduce energy use by promoting domestic water conservation and requiring water efficient landscape improvements associated with new construction. (See also AN1.3 and AN2.1.)***

## Objective BE2: Improve the energy supply by switching from fossil fuels to renewables.

Although the regulatory and political barriers are extremely high for local jurisdictions, switching from fossil fuels to renewables may offer the greatest actually reductions in GHG emissions. Some of Napa's jurisdictions have expressed and interest in exploring this possibility, so it is included in this Framework with caveats about the challenges involved.

The current level of supplied renewable energy in Napa County is 14 percent. California state law requires all the utilities to supply at least 20 percent of their electricity deliveries from renewable generation by 2010. By executive order, the renewable portfolio requirement was set at 33 percent by 2020.

### Switching from Fossil Fuels to Renewables

Napa County can decrease its use of electricity that is generated by fossil fuels and decrease its use of natural gas if PG&E alters its energy portfolio or if Napa County decides to purchase green power independent of PG&E, as AB 117 enables it to do.

Napa County has three available options under California law to seek alternatives that can offer the ability to invest local dollars in more renewable energy and efficiency:

**1. Form a Municipal Utility District (most difficult).**

**2. Form a Community Choice Aggregation (difficult – high impact).** A Community Choice Aggregation (CCA) can be formed via ordinance by local government and then put its electricity franchise out for competitive bid similar to a solid waste hauling franchise. A competitive bid offer provides opportunity for a greener and more stable electricity product through development of a local renewable generation portfolio. More cost effective than the renewable generation development offered by PG&E. Local distribution grid operation and billing still performed by PG&E

**3. Locally produced power (easier – lower impact)** Natural gas use accounts for approximately 20 percent of emissions in Napa County. The natural gas is used primarily for space and water heating in the residential and commercial sectors. Renewable energy sources can be used to replace natural gas for space and water heating applications. Solar water heaters are a well known and well understood technology, widely used and relatively inexpensive. Heat pump technology can use either latent heat in the earth or in the air (ground source and air source heat pumps). Where it is available, geothermal heat can be used to replace natural gas directly for water heating or space heating.

***ACTION BE2.1: Increase local renewable energy generation such that the County will always generate more than 15 watts of renewable energy per capita.***
***ACTION BE2.2: Adopt policies and ordinances to remove regulatory impediments and***

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***economic disincentives associated with the generation and use of energy from renewable sources such as wind, geothermal and solar energy.***

## Financing

Having a set of complementary, versatile tools and knowing when and how to use them optimizes performance. A set of financing tools applied where best suited can overcome barriers and maximize uptake of both demand reduction measures and the deployment of small scale renewable generation. This will enable maximum GHG emission reduction most quickly at the lowest cost.

Descriptions of the best and most applicable financial tools we found for the electricity/natural gas sector follow.

### Community Choice Aggregation (CCA)

Community Choice Aggregation allows cities and counties to determine their own electric energy supply, under AB 117 (Migden—2001). A powerful feature of a CCA is its ability to access one of the least costly financing sources, municipal revenue bonds also called H-Bonds. The bonds are used by the CCA to finance construction of the local renewable portfolio. A CCA can issue these bonds without voter approval. They are not General Obligation bonds, so they do not put the municipality's General Fund at risk. H-Bonds are repaid from the electricity rates set by the CCA and charged to its customers.

### AB 811 (Financing Initiative for Renewable and Solar Technology)[31]

AB 811 became California law in September 2008. This legislation modified the California Streets and Highways code to allow local government to establish voluntary assessment districts. Under AB 811, local governments can loan money to property tax payers (residential and commercial) who opt-in to install on their buildings permanent energy efficiency improvements, as well as small scale electric generation, energy efficiency and retrofits, and solar hot water systems. The legislative body of any city, as well, is authorized to designate an area within which authorized city officials and willing property owners may enter into contractual assessments and make arrangements to finance public improvements to specified lots or parcels.

Several municipalities throughout the state have approved and implemented AB 811. Residents and businesses in these municipalities are able to finance the installation of energy efficiency improvements and distributed generation, renewable energy sources that are permanently fixed to real property within jurisdictions with low interest loans, which can be repaid in up to 20 years on property taxes. These municipalities include Palm Desert, Sonoma County and Marin County, among others.

This action is ideal for financing building envelope retrofits.

### Tariffed (utility-based) On-Bill Efficiency Purchase (PAYS)

This financing mechanism can be used by any utility. Customers pay for efficient appliances by agreeing to make monthly payments on their utility bill. Energy savings from purchased

[31] See Appendix E: Implementing an AB 811 Program in Napa County.

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appliances exceed finance cost. Customers have no up-front payment, no debt obligation, no credit checks and no liens.

There are several examples of tariff systems throughout the country including New Hampshire, Michigan, New York and Hawaii, as well as PacifiCorp and Midwest Energy utility companies. In most cases, PAYS programs are operated by cooperative utility companies and investor-owned utilities. These financing systems can be paired with state public benefit funds. Regulatory policies that encourage utilities to develop and run energy efficiency programs can be vital to the success of on-bill financing programs. Third-party financing may be a viable alternative to on-bill financing systems provided through a utility. Possible methods of encouragement include performance-based financial rewards for running successful energy efficiency programs and profit restructuring mechanisms that address the throughput incentive.

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## Emissions Reduction Summary – Improve Buildings and Energy and Energy Efficiencies

| Objectives | Implementer | Notes and Assumptions | Potential Metric Tons GHG Reduced from BAU | Estimated Investment | Annual Savings (electricity & NG costs avoided) | Investment per Metric Ton GHG Reduced |
|---|---|---|---|---|---|---|
| Objective BE1: Reduce energy demand through conservation and efficiency. | | | | | | |
| Improving the efficiency of existing buildings *(Actions BE1.1, BE 1.2, BE 1.3)* | All Jurisdictions (Implement AB811 Program) | Assumes 60% of residential households participate and improve efficiency by 40% per household | 27,000 metric tons or 6% of target reduction | $133 million *(residential only)* or annual repayment cost of $12.5 million (financed at 7% over 20 yrs) | $11.5 million annually (annual savings does not include projected utility rate escalation) | Program is revenue neutral (annual cost roughly equal to annual savings assuming rate escalation) |
| | Community Choice Aggregator (CCA) | Assumes implementation of alternative appliance rebate programs (appliances not covered by AB811 program) | 5,000 metric tons or 1% of target | $39 million (annual repayment of $3.7 million financed at 7% over 20 yrs. Repayment amount represents end-user costs only other 50% is funded through electric rate) | $3.7 million annually | Program is revenue neutral (annual cost roughly equal to annual savings) |
| | Municipal Water Utility (e.g. water utility could cover all other water using appliances not covered by AB811) | High performance efficiency programs that eliminates upfront purchase costs and indebtedness (e.g. PAYS program) | 30,000 metric tons or 6% of target (assumes 80% uptake and 60% efficiency improvement. Renters are also eligible) | $102 million (annual repayment of $9.7 million financed at 7% over 20 yrs) | $9.6 million annually | Program is revenue neutral (annual cost roughly equal to annual savings) |
| Reducing the growth of electricity and natural gas use *(Actions BE1.4, BE1.5)* | All Jurisdictions (e.g. implement green building ordinances) | Less than 3% of total emissions in 2020 are due to growth in electricity and natural gas. This growth will be reduced even further by Title 24 changes. | up to 15,000 metric tons or 3% of target reduction | Costs depend on development | Savings depend on development | Higher purchase prices for high efficiency buildings are recoverable by owner over time. |

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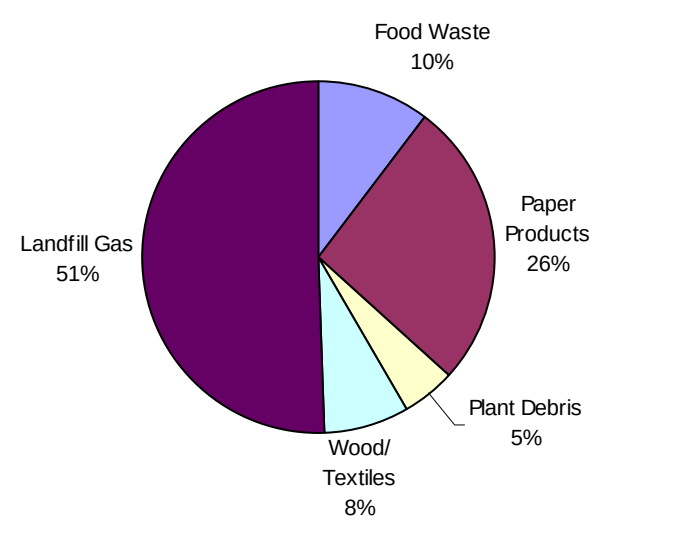
## Goal 3. Reduce Consumption and Solid Waste (SW)

Direct greenhouse gas emissions in the solid waste sector come primarily from anaerobically decomposing organic material in landfills (such as food scraps, yard debris, and paper) that produce methane and carbon dioxide. Significant quantities of indirect emissions are also connected to mining, manufacturing and transport of products and packaging. Substituting recycled materials for virgin materials in the manufacturing process reduces the GHG emissions, sometimes dramatically as in the case of aluminum, and less so with other materials, like glass.

Community Waste Greenhouse Gas Emissions 2005




**Landfill gas and paper products are the major waste sources of greenhouse gases in Napa County.**

GHG emissions from solid waste are reduced by removing organic waste from the wastestream prior to landfill by diverting organics to composting or other recycling efforts, and by managing emissions from landfills. At a minimum, burning landfill gas in a flare reduces GHG impacts from methane. Even better is using the landfill gas as a fuel for electric power generation. This energy source can increase the renewable fraction of the community energy supply and reduce the need for energy produced from fossil fuels.

Solid waste produced by Napa County in 2005 accounts for 54,209 tons of GHG emissions, equal to 4.7 percent of the County's total GHG emissions.[32]

Napa County's solid waste is currently disposed at two locations, the Keller Canyon Landfill in Contra Costa County and the Clover Flat Landfill near Calistoga. The area served by the Clover Flat Landfill is essentially the same as the area of the Upper Valley Waste Management Agency, with about 20% of the county's waste buried there annually. The remaining 80% of Napa's waste is currently transferred from the Devlin Road Recycling & Transfer Facility to the Keller

[32] Napa County ICLEI 2005 Inventory

Canyon Landfill site. Both sites have landfill gas recovery systems that are estimated by the USEPA to be approximately 75% effective in recovering and controlling emissions of landfill gas.[33]

In 2009 the Keller Canyon Landfill installed a landfill gas-to-energy plant to generate electricity and is therefore productively utilizing Napa County's and other North Bay communities' waste.

In contrast, the Clover Flat Landfill only flares the gas collected from the landfill. Based on industry experience and communication with Upper Valley Disposal & Recycling Company, owner of the Clover Flat Landfill, this facility may now be generating enough landfill gas to enable installation of a landfill gas-to-energy plant that could produce a significant amount of GHG-free electricity..[34] This possibility merits serious study and follow up.

### Methods to Reduce Waste

Modern solid waste management uses a hierarchy of approaches in order of greatest to least environmental and climate benefit:

- First—**REDUCE** the amount of waste created through efficient use of resources, more durable products, less packaging, buying less stuff, etc.
- Second—**REUSE** products and packaging as much as possible, i.e., thrift stores, coffee mugs instead of single-use cups, reusable produce crates/pallets, etc.
- Third—**RECYCLE** discards, including products, packaging, and organics (through composting).
- Finally, after doing all the above, landfill what's left, and then collect and use the landfill gas productively through energy production.

From a climate protection perspective, the ideal is to reach "zero waste" where nothing is landfilled and no fossil fuel is used to manage or transport waste. This is a concept equivalent to natural biological processes where the "wastes" from one organism are "food" for others, in a continuous cycle, or more accurately, an interconnected web.

Collecting, processing and burying municipal solid waste in landfills requires a significant amount of energy. Emissions from these activities are compounded by subsequent emissions of landfill gas. Although proper management of landfills can significantly reduce the impact of these gas emissions, landfills still release some methane, a very potent greenhouse gas. An effective method for reducing landfill methane emissions is by reducing the organic fraction of the waste being buried. These organics can be composted to create soil amendments or used as a fuel for energy production.

## Objective SW1: Achieve overall waste diversion of 75% to 90% by 2020.

The actions described below will achieve overall waste diversion by:

- Increasing overall diversion rates
- Reducing the amount of waste generated

[33] http://www.epa.gov/lmop/faq-1.htm
[34] Conversation between Ken Wells, consultant for CPC, and Bob Pestoni, owner, UVDS on Sept. 11, 2009.

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- Reusing products and packaging
- Recycling or composting discards

## Increasing Overall Diversion Rates

Diverting waste minimizes the land required for disposal sites for solid waste. Waste in landfills affects groundwater and soil; waste diversion from landfills supports clean and productive land. When waste is diverted, the environmental impact is reduced. Construction waste, demolition and organic wastes contribute a high volume of material to landfills. Recycling and composting such material can reduce the overall volume of waste added to landfills every day, while providing resources for other economic sectors. Reused construction waste and compost, for example, can act as a valuable commodity for construction companies, salvage yards and nurseries.

***ACTION SW1.1: Enact ordinances and create incentives to increase construction and demolition debris waste diversion from 75% to 90% by 2020.***

### Additional Opportunities

Additional opportunities to increase overall diversion rates include:

- Enact mandatory recycling ordinances and provide financial incentives to increase residential, commercial, and construction and demolition debris recycling.
- Require multi-tenant commercial/residential building owners/managers to provide on-site access to recycling and composting containers/service.
- Create and support other collaborative and regional programs, such as the Napa County Green Business Program, environmentally preferable purchasing policies and joint-purchasing agreements among all local jurisdictions, to support the 75% or more overall waste diversion goal.
- Implement an intensive social marketing program to address barriers to recycling behaviors and promote resource conservation.

## Reducing the amount of waste generated

Actions to reduce the amount of waste generated are primarily focused on shifting consumption behaviors to less GHG-intensive products. These regulatory tools, education efforts, and economic incentives are intended to create long-term changes in consumer behavior. Therefore, establishing short-term potential greenhouse gas reduction estimates is very speculative. The costs related to these actions are ongoing and primarily for staffing and various types of communications. The social marketing aspects of this action can be integrated into the recycling education efforts described above.

Ordinances and incentives that could reduce waste generated include:

- Encourage the efficient use of resources through buying less stuff, more durable products, and less packaging.
- Reduce the volume of organics handled by the solid waste collection system through on-site agricultural, commercial and residential composting which reduces the emissions

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associated with moving this material from the generator to the compost facility or disposal site, as well as the emissions generated by production of synthetic fertilizers that can be offset by use of organic soil amendments.

- Support legislation and other efforts at local, state and federal levels that extends producer responsibility for managing their products and packaging at the end of their intended use.
- Encourage purchasing locally manufactured products.
- Provide criteria for purchasing locally produced items with recycled content.
- Educate residents and businesses on purchasing decisions. Identify and display the carbon emissions of products.
- Eliminate, through local ordinance, the use of non-recyclable takeout food containers.

***ACTION SW1.2: Enact ordinances and create incentives to achieve organic (food and green) waste diversion of 75% by 2020, including waste diversion from restaurants and special events.***

## Reusing products and packaging

Reuse is a means to prevent solid waste from entering the landfill and to distribute discarded products to those who want them. In many cases, reusing products and packaging supports local community and social programs while providing donating businesses with tax benefits and reduced disposal fees. The Napa County Recycling and Waste Services have inaugurated a pilot program for commercial food composting involving 8 local restaurants, caterers and stores, some of which now divert 100% of their food waste from land fills.

Reuse requires fewer resources, less energy, and less labor, compared to recycling, disposal, or the manufacture of new products from virgin materials. Reuse strategies and programs provides an alternative to other waste management methods since it reduces air, water and land pollution, and limits the need for new natural resources.

***ACTION SW1.3: Create and support other programs, such as the Napa County Green Business Program, that help achieve the 75% to 90% overall waste diversion goal.***

***ACTION SW1.4: Adopt environmentally preferable purchasing policies and explore joint-purchasing agreements with partner agencies, and local jurisdictions and businesses.***

## Recycling or composting

Recycling and composting actions are primarily focused on removing organic wastes that have higher immediate greenhouse gas impacts than other waste types. Revenue to cover the costs for this action set can be collected in a number of different ways, most commonly through refuse collection rates and user fees, although franchise fees on waste haulers, landfill host fees and AB 939 fees can also be utilized. In order to divert 75% of the overall Napa County wastestream, about 40% (70,000 tons) of the 177,000[35] tons of wastes still going to landfill need to be diverted.

[35] CIWMB 2005 Diversion/Disposal Rate Reports, see Appendix I.

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By applying the California Integrated Waste Management Board's (CIWMB) 2003 California waste characterization data[36] to Napa's waste quantities, we can assume that 30% of Napa's waste going to landfill is organic. Of this compostable fraction, diverting two thirds of this from the landfill would represent about 35,000 tons per year or 100 tons per day of additional compost feedstock which can be composted or used as an energy source in an anaerobic digester. Applying the USEPA WARM tool to this type and quantity of organic waste results in a 3,700 ton per year reduction in greenhouse gas emissions (see calculation in Appendix I) from the solid waste sector attributable to Napa.

***ACTION SW1.5: Establish collection services in all cities for segregated food waste from commercial sources and establish a local food composting facility.***

***ACTION SW1.6: Encourage home composting of organic waste.***

## Costs and Funding Opportunities

Funding and financing for the solid waste sector offer some special opportunities for local governments. User fees on waste generators to fund recycling education and other diversion efforts can be implemented by local jurisdictions—without going to a public vote—in a number of different ways, including collection rates, franchise fees on waste haulers, landfill host fees and AB 939 fees. Additionally, energy programs using solid waste and landfill gas are considered renewable energy sources, and are eligible for California and federal rebates, tax incentives and special financing.

### Increasing Overall Diversion Rates

Increasing overall diversion rates is primarily focused on removing typical recyclables from the waste going to landfill. By recycling these materials and using them to replace virgin materials, significant GHG emissions are avoided. Although the reduced GHG emissions are substantial, much of the savings are indirect and accounted for in transportation and other savings. Costs for this action set can be collected in a number of different ways, including waste collection rates, franchise fees on waste haulers, landfill host fees and AB 939 fees. In order to divert 75% of the overall Napa County wastestream, about 40% (70,000 tons) of the 177,000[37] tons of wastes still going to landfill need to be diverted. By applying the CIWMB's 2003 California waste characterization study to Napa's waste quantities, we can assume that 40% of the wastestream is recyclable paper, metal, plastic and glass. Of this recyclable fraction diverting one-half (20% of the total waste stream) would represent about 35,000 tons per year or 100 tons per day of additional recyclables. Applying the USEPA WARM tool to this type and quantity of mixed recyclables results in a 90,000 ton per year reduction in Scope 3 greenhouse gas emissions (see report in Appendix I).

### Reusing Products and Packaging

Reusing products and packaging requires staff time and communications, education and community outreach to maximize diversion opportunities.

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[36] http://www.ciwmb.ca.gov/Publications/LocalAsst/Extracts/34004005/Tables.pdf

[37] EPA's Global Warming—Waste, "Measuring Greenhouse Gas Emissions from Waste" http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_Form.html, see Appendix I for calculations.

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The social marketing and community outreach aspects of this action should include other resource conservation behaviors. Educational cost estimates are based on spending $5 per household per year above current recycling educational expenditures. With about 50,000 households in Napa County an annual outreach budget of $5 per household is $250,000. This funding level provides one to two contacts per household per year.

Regulations establishing economic incentives to reduce waste and encourage reusable packaging are more efficient when enacted at the state or federal level; however this action set can be used as a local action. If implemented locally, it should be considered a regional approach to avoid other unintended economic impacts, such as shifting consumer purchase patterns from one community to another. Due to the diffuse and indirect greenhouse gas impacts from this action, establishing a potential greenhouse gas reduction estimate is very speculative. The cost of the social marketing aspects of this action can be integrated into the recycling education efforts described above.

### Recycling and Composting

Based on other similar programs such as Jepson Prairie Compost in Yolo County and Sonoma Compost in Sonoma County, mixed organics can be processed into compost for about $40/ton, with an annual cost of about $1.4 million. With offsetting savings from reduced landfill tipping fees, this program could result in little to no net cost increase. Funding necessary for the collection and processing of the organics can be obtained with solid waste collection fees.

In order for this program to increase organics diversion and composting beyond the levels already achieved, focused efforts are necessary to inform and increase participation by residents and businesses. These outreach efforts to increase organics diversion can be combined with other waste recycling goals for a more cost-effective outreach effort. Educational cost estimates are based on spending $5 per household per year above current recycling educational expenditures. This cost is included with Action SW1.1.

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## Emissions Reduction Summary – Reduce Consumption and Solid Waste

| Solid Waste | Implementer | Feasibility | Potential tons GHG reduced by 2020 |
|---|---|---|---|

| Objective SW1. Achieve overall waste diversion of 75% to 90% by 2020. | | | |
|---|---|---|---|
| Increasing overall waste diversion (Action SW1.1) | UVWMA, N-VWMA, County, cities | Moderate | 90,000 tons/year (reductions not counted toward target) |
| Reducing the amount of waste generated (Action SW 1.2) | UVWMA, N-VWMA, County, cities | Easy to Difficult | To be determined |
| Reusing products and packaging (Action SW1.3) | UVWMA, N-VWMA, County, cities | Moderate | To be determined |
| Recycling or composting (Action SW1.5, SW1.6) | UVWMA, N-VWMA, County, cities | Moderate | 3,700 tons/year (reductions not counted toward target) |

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## *Goal 4. Conserve Agriculture, Natural Resources, and Urban Forests (AN)*

Globally, about 25 to 30 percent of annual GHG emissions are due to deforestation. The carbon dioxide sequestered in soil, trees, and other vegetation is released into the atmosphere when land is converted to other uses, including agriculture. While the agriculture and forest sectors represent less than 4 percent of GHG emissions in Napa County, they have the potential, with new practices, to act as a sink, tying up or sequestering GHG emissions from the atmosphere in the form of soil and wood carbon.

### Agriculture

Agricultural areas are widespread throughout the County, with vineyards and rangeland countywide. Of Napa County's approximately 485,000 acres, 51,000 acres (or 10.5 percent of the total area) are active agricultural lands consisting primarily of vineyards with smaller areas of crops and orchards. The County has approximately 53,800 acres of existing grazing land.[38] Additionally, acreage under vineyard cultivation is expected to continue to grow in Napa County, with an additional 10,000 acres projected by 2030.

While Napa County is known for its wine grape growing, a small variety of agricultural crops are also grown, including walnut and olive orchards, strawberries, artichokes, among others.[39] Agriculture is the leading source of revenue for Napa County.

Total GHG emissions from the agricultural sector are a result of a complex network of sources including livestock, agricultural equipment, fertilizer application, soil tillage, crop residue burning, land conversion for agricultural use, processing, refrigeration, and distribution.[40] For this reason, calculating the GHG emissions from the agricultural sector of Napa County is more demanding than for other sectors in this Framework.

Given this complexity of calculations, agriculture emissions for Napa County are not determined except for the $CO_2$ equivalent emissions from tractors and other farm equipment. In 2005, the BAAQMD estimated these emissions at 33,046 metric tons, which is approximately 3% of the total countywide GHG emissions.

In general, methane gas from livestock and manure is 23 times more potent than $CO_2$ and therefore can be a significant contributor of GHG emissions. In Napa County, however, given the very small number of livestock (approximately 9,000),[41] the methane gas is considered insignificant. The Napa County General Plan Environmental Impact Report (EIR) explored four land use scenarios for future development in the County. Each scenario evaluates environmental impacts resulting from projected development. The scenarios range from a minimum development, or "No Build," scenario to a "Build Out" scenario. Ultimately, the Draft

[38] Napa County Baseline Data Report, Chapter 10, Agricultural Resources.
[39] Napa County Baseline Data Report, Chapter 10, Agricultural Resources.
[40] Winery emissions related to fermentation are not relevant to this analysis since only use of ancient carbon related emissions are considered.
[41] US Department of Agriculture. *2007 Census of Agriculture: Napa County California.* Available online at: www.agcensus.usda.gov

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EIR determined that less future development will promote future GHG emission reduction goals.[42]

The proposed actions will not only reduce emissions from current agricultural practices, but will also act to remove and sequester carbon dioxide from the atmosphere. That is, the actions move toward a net reduction of atmospheric carbon dioxide. This is a feature that makes agriculture and forestry unique: they can act as carbon "sponges" to soak up carbon dioxide. So these actions not only reduce emissions to zero, they go "beyond zero" to create carbon sinks.

One-sixth of GHG emissions from agriculture are from burning or fossil fuels to run machinery and vehicles. If other aspects of the farming industry are incorporated, such as food production and transportation, agriculture is associated with almost one-quarter of US emissions.[43] The farther food travels to Napa's cities and county from its source, the more fossil energy is expended and the more carbon is released into the atmosphere. Researchers estimate that it takes about 10 calories of fossil energy to put one calorie of food on our plates in North America. About 70 percent of these calories are dedicated to transportation and processing.[44]

Organic and local food practices, however, produce less energy to maintain, produce fewer GHG emissions, avoid the use of chemical fertilizers and are more resilient in the face of drought of any kind, including that brought on by climate change.[45] Sustainable agriculture and localized food systems have the potential to mitigate nearly thirty percent of global GHG emissions and save one-sixth of global energy use.[46]

Woody and herbaceous plants, manure, and algae (or biomass) generates energy when burned that can be used directly as heat or can be converted into electricity. Some types of biomass can be used directly as heat or can be converted into electricity. It is considered a carbon neutral energy source.[47]

**Agricultural Waste Strategies**

Agricultural "waste" is a resource that can be used to create additional revenue, increase soil health, and increase yields.

- Create on-farm and centrally located facilities to process all residential "green can" waste, as well as equestrian and agricultural waste.
- Explore feasibility of processing this waste in anaerobic digesters and use in energy production and soil management.

[42] Napa County. *Napa County General Plan Draft Environmental Impact Report.* February 2007.
[43] Climate Action Project. *Agriculture and Rural America.* October, 2008. Available online: www.climateactionproject.com.
[44] Pimentel, David and Marcia H. Pimentel. *Food, energy, and society.* Boca Raton, Florida: CRC Press, 2008.
[45] *Regenerative Organic Farming: A Action to Global Warming*. LaSalle, T., Ph.D. and Hepperly, P., Ph.D. 2008 Rodale Institute. www.rodaleinstitute.org/files/Rodale_Research_Paper-07_30_08.pdf
[46] Ho, Dr. Mae-Wan and Lim Li Ching. *Mitigating Climate Change through Organic Agriculture and Localized Food Systems.* ISIS Report 31/1/08
[47] ICLEI – Local Governments for Sustainability. Biomass Technologies.

## Objective AN1: Encourage responsible and sustainable agricultural and landscaping practices.

Actions described below will encourage responsible and sustainable agricultural and landscaping practices by:

- Supporting local agriculture, food production, and community gardens
- Promoting water conservation

### Supporting Local Agriculture, Food Production, and Community Gardens

***ACTION AN1.1: Adopt policies and ordinances that support local agriculture, food production, and community gardens. Support efforts by local growers and restaurants to produce and use locally grown food products, and remove associated regulatory hurdles.***

***ACTION AN1.2: Support efforts by local growers and restaurants to produce and use locally grown food products and remove associated regulatory hurdles. (See also T10 and AN1.)***

### Promoting Water Conservation

***ACTION AN1.3: Adopt water efficient landscape ordinances that promote climate-appropriate plants, efficient irrigation, and non-potable water sources.***

### Natural Resources

Water is a valuable natural resource in Napa County. Many of the areas in the eastern regions of the county have very limited water resources, and in some areas where there is water, the boron concentration is quite high and too high for crop production.[48] There are a total of 22,431 acres of water in the county, or 4.43 percent of the total land.[49] Suitable climate and an irrigation water source will likely continue to support future conversion of land.

Access to clean water, energy, mineral resources, and availability of productive land are all threatened by changes in climate. The warmer winter and spring temperatures of recent years could adversely affect the capacity and reliability of the California water system with respect to water shortage and flood management, and requires changes in water reservoir management rules.

Urban water conservation, reclamation and reuse of water, land and water use, and drainage management protect and conserve valuable water resources. Water reclamation systems provide an exemplary infrastructure to use water efficiently. Gray water is tap water soiled by use in washing machines, tubs, showers and bathroom sinks. It is not sanitary, but it is also not toxic and generally disease free. Gray water reclamation is the process by which households make use of gray water's potential instead of simply piping it into overburdened sewage systems with all water that travels down the drain.

[48] Napa County Baseline Data Report, Chapter 10, Agricultural Resources.
[49] Napa County Baseline Data Report, Chapter 10, Agricultural Resources.

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Reducing water used outdoors can make the biggest difference in saving water in Napa County. Water efficient landscaping opportunities include: water-efficient irrigation systems and climate appropriate plants and trees. These design decisions are based on the following principles: proper planning and design, soil analysis and improvement, appropriate plant selection, practical turf areas, efficient irrigation, use of mulches and appropriate maintenance.[50]

Benefits of this type of landscaping include: conservation of natural resources, decreased energy use, and reduced runoff and irrigation water that carries top soils, fertilizers and pesticides into lakes.

## Objective AN2: Reduce water use and protect local water resources.

Actions described below will reduce water use and protect local water resources by:

- Reducing demand of potable water and developing water service and infrastructure

### Reducing demand of potable water and developing water service and infrastructure

***ACTION AN2.1: Develop and implement water conservation plans that include financial incentives, educational programs, and ordinances that reduce the per capita demand of potable water.***

***ACTION AN2.2: Develop and enhance recycled water service and infrastructure to serve all areas of Napa County.***

### Financing Options

Also known as Mello-Roos, Community Facilities District Funding provides a means through which local government agencies obtain funding for public improvements, such as water and wastewater systems, roads, schools, etc. The district sells bonds to finance the improvements, and taxes from real property owners in the district pay off the principal and interest on the bonds. Formation requires two-thirds majority vote of residents within the boundaries of the district. These bonds can pay for facilities that transmit and distribute potable and nonpotable water.

In addition to Community Facilities District Funding, the California Department of Water Resources provides grants annually for water use efficiency projects. The Bay Area Air Quality Management District periodically provides grants to help fund climate protection programs and policy development projects in the Bay Area. The Community Foundation provides funding, as well, to communities who are interested in exploring innovative planning projects and processes.

### Forests

Forests and urban trees reduce atmospheric carbon dioxide ($CO_2$) through sequestration and other greenhouse gases by conserving energy used for space heating and cooling. Carbon

[50] US Environmental Protection Agency. *Water-Efficient Landscaping: Preventing Pollution and Using Resources Wisely.*

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sequestration is the process by which $CO_2$ is transformed into above- and below-ground biomass and stored as carbon.

Conversion of forestland to development and agriculture releases $CO_2$ and also diminishes the future capacity of the forest to remove $CO_2$ from the atmosphere. As mentioned in other sections of this Framework, current projections indicate that lands in vineyard cultivation will increase significantly in the next 20 years, although it is not clear how much of this additional vineyard land will be converted from forest land. The County has roughly 40,000 acres of land that is capable of growing timber, with 30,000 acres that are currently functioning as timberland.[51] Commercial timber species include Coast Redwoods, Incense Cedar, Douglas Fir, Western Red Cedar and Jeffrey Pine, among many others.

These lands can be conserved to minimize the $CO_2$ emissions associated with conversion of timberland to other uses, such as vineyards. Additionally, land can be restored and managed to remove additional $CO_2$ from the atmosphere, while also providing wood products and many other public benefits. The proposed actions to preserve, restore, and manage the County's forestlands and change impactful agricultural practices will result in minimizing emissions and maximizing carbon uptake.

By fostering and restoring forests and other terrestrial ecosystems that offer significant carbon mitigation potential, Napa's cities and County will reduce total GHG emissions and protect valuable natural resources. Major contributors to GHG emissions, such as vehicle traffic and energy use, can be reduced on a local level through the implementation of sustainable development policies.

Planting trees in communities can make a difference when it comes to protecting the climate and mitigating the impacts of climate change.[52] Planting trees strategically to shade east and west walls of residential buildings would reduce air conditioning energy use. Shade trees also dramatically reduce the heat island effect of urban areas, which refers to built up areas that are hotter than nearby rural areas.[53] Implementing living (or green) roofs and transitioning from dark surfaces to light surfaces help to keep urban area temperatures cool and can reduce the summer peak electric load.[54] If tree planting actions were applied statewide, it is estimated that the amount of total $CO_2$ reduction annually would be 3.6 percent, equivalent to retrofitting homes with energy-efficient electric appliances.[55]

There are many best practices throughout the country that provide guidance to Napa's cities and County. The City of Los Angeles developed a method for locating potential tree-planting sites in urban areas, for example. The efficacy and cost-effectiveness of various forest management activities requires the development of reliable, accepted carbon measuring and

[51] Napa County Baseline Data Report, Chapter 10, Agricultural Resources.
[52] US Forest Service, Climate Change Resource Center, Urban Forests and Climate Change, August 2009.
[53] US Environmental Protection Agency. Heat Island Effect. September 2009. Available online at: www.epa.gov.
[54] Columbia University Center for Climate Systems research and Nasa/Goddard Institute for Space Studies. *Mitigating New York City's Heat Island with Urban Forestry, Living Roofs, and Light Surfaces: New York City Regional Heat Island Initiative*. The New York State Energy Research and Development Authority, June 2006.
[55] US Forest Service, Climate Change Resource Center, Urban Forests and Climate Change, August 2009.

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monitoring protocols.[56] The US Forest Service Urban Forest Project Reporting Protocol provides detailed guidance to insure that tree planting projects meet eligibility requirements, produce GHG reductions that are additional to a baseline, are sustained for at least 100 years, and do not detract from management of existing trees.

Similarly, the Board of Forestry (BOF) has been involved in the development of forest protocols. The California Air Resources Board's (CARB) Scoping Plan states that the forest sector must achieve a "no net loss" target, which means it must achieve reductions in $CO_2$ equivalent to the current statewide forest carbon budget. Although regulatory protocols are still under development, such a policy suggests that if forestland is converted to vineyards, any loss in $CO_2$ sequestration capacity would need to be mitigated. BOF has developed strategies to reach this target and plans to use a combination of regulatory, statutory and incentive-based approaches to meet these goals.[57]

## Objective AN3: Protect and increase the amount of vegetation and biomass in soil and reduce emissions from agricultural sources.

Actions described below will protect and increase the amount of biomass in soil and reduce emissions by:

- Promoting sustainable business
- Assessing impacts on carbon sequestration
- Protecting habitat

### Promoting sustainable business

***ACTION AN3.1: Support and promote the Napa Green Certified Winery Program and the Napa Green Certified Land Program ("Fish Friendly Farming"), as well as other practices.***

### Assessing impacts on Carbon Sequestration

***ACTION AN3.2: Assess the positive or negative impacts of land use changes, new vineyards, and urban development on carbon sequestration.***

### Protecting habitat

***ACTION AN3.3: Adopt policies, ordinances, and plans that create and enhance urban forests and greenways.***

***ACTION AN3.4: Adopt policies and ordinances to protect habitat and mitigate the conversion of oak woodlands and other important plant communities by permanently protecting similar habitats.***

[56] California Energy Commission. *Methods for Measuring and Monitoring Forestry Carbon Projects in California.* 500-04-072F. April 2004.
[57] Board of Forestry, Climate Change Board. Available online at: www.fire.ca.gov.

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### Financing

The US Forest Service may have the capacity to collaborate with the County and cities of Napa to implement habitat protection and urban forestry programs. Additionally, funds provided by the Bay Area Air Quality Management District, which are provided periodically, may be applicable to urban forestry and habitat restoration projects.

## Emissions Reduction Summary

Given the complexity of current and projected GHG emission calculations and associated funding, proposed actions to reduce GHG emissions sourced by agricultural, natural resources and forest have not been quantifiably assessed to determine potential implementers, feasibility, potential tons of GHG reduced, co-benefits, and estimated investment of each action.

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## *Goal 5. Increase Community Engagement (CE)*

Community engagement involves educating citizens about policy issues and including them in problem-solving and decision-making processes. It is a multifaceted, ongoing practice of moving communities towards change for the benefit of the entire community.

Research demonstrates that the strongest plans stem from planning processes that involve a broad array of stakeholders—partnerships with businesses, organizations, and individuals throughout the cities and County of Napa. Stakeholders include environmental groups; affordable housing groups; business groups; local elected officials; agriculture groups; seniors' groups; development groups; neighborhood groups; and local government departments. Comprehensive community engagement includes involving those who may be historically left out or who are less oriented to action.

Any action plan adopted must foster a collaboration of citizens, businesses and green initiative groups who become engaged and contribute to a sustainable future. Community engagement activities will also help ensure the implementation of the Climate Action Framework over the course of the next 10 years. Broad public involvement allow planners to understand problems related to climate action and protection policies and programs, thereby allowing them to develop a strong set of policies for dealing with them.

Community engagement activities and partnerships are part of the planning process for City and County governments. Consequentially, there tends to be a framework in place when jurisdictions decide to develop a public outreach campaign. Existing frameworks and partnerships can be built upon to promote emission reductions and strategies.

### Objective CE1: Market programs and conduct community outreach to increase participation in GHG reduction efforts.

GHG emissions reduction begins with a fundamental understanding among community members regarding the importance of and need to engage in behavioral and lifestyle changes. An inclusive community outreach plan will reflect the ideas and culture of the entire community and allow all to share ideas and feel comfortable. Achieving an effective and inclusive community outreach program does not happen overnight. It takes time, energy and commitment to build strong and effective participation in GHG reduction efforts.

Many communities choose to develop a position that is responsible for advocacy, facilitating implementation of the Climate Action Framework and outreach, among other tasks. The City of Richmond, for example, hired a Sustainability Coordinator to oversee the City's sustainability services and to coordinate regional efforts. The County and cities currently do not have a similar position. Comprehensive community engagement, as outlined in this plan, is a multi-faceted undertaking that includes advocacy, research, and outreach. Funding resources could be pooled to support a regional entity that is responsible for climate-related programs and activities.

***ACTION CE1.1: Partner with community-based non-profit organizations, schools, and others engaged in public outreach and education efforts that broaden community involvement in reducing greenhouse gas emissions.***

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***ACTION CE1.2: Partner with utilities, energy service providers and community-based non-profit organizations to encourage participation in incentive programs that improve energy and water efficiency.***

***ACTION CE1.3: Partner with public agencies, non-profit organizations and private employers to offer incentives aimed at reducing drive-alone commuting and promoting car-free tourism.***

***ACTION CE1.4: Promote programs designed to advance sustainable business practices, such as the Napa County Green Business Program and sustainable agricultural practices, such as the Napa Green Certified Land Program.***

## Objective CE2: Engage and advocate for collaborative policy and legislative actions at regional, state, federal and global levels to reduce GHG emissions.

The implementation of a climate action plan often requires unique and innovative skills. It presents an opportunity to develop the local and regional workforce. The Center for Urban Economic Development at the University of Illinois found that the Chicago Climate Action Plan presented an opportunity to create green jobs, reducing poverty while revitalizing Chicago's economy. The Center identified areas where an economic and workforce development strategy may be targeted to ensure a sufficient supply of skilled workers and open up pathways to "green collar" jobs and careers for disadvantaged segments of the community.

They determined that the implementation of the Action Plan would create the following new jobs: weatherization work; renewable energy installation, including solar, geothermal and "small wind;" transit construction, operators and maintenance workers; train conductors and yard workers; renewable energy development; processing, handling and resale / remanufacture of materials; water infrastructure construction, green roof design, installation and maintenance; and indirect jobs in program administration, warehousing and materials. The following jobs were determined to be critical to carrying out climate actions in the plan: "green" construction: building maintenance and operations workers: energy engineers: "smart grid" installation workers: urban planners and designers: industrial engineers: civil engineers and technicians: and landscape designers and architects.

The US Mayors Climate Protection Agreement illustrates the ability of local governments to advocate for emissions reduction at a national and international level. In November 2007, mayors from across the country gathered in Seattle to sign the Agreement. To date, the Agreement has been signed by more than 1010 mayors. By signing the agreement, the mayors commit to three actions:

- Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to urban forest restoration projects to public information campaigns;
- Urge their state governments, and the federal government, to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol—7% reduction from 1990 levels by 2012; and

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- Urge the US Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emissions trading system.

***ACTION CE2.1: Engage and assist local agencies and utility companies toward achieving greenhouse gas reduction targets.***

***ACTION CE2.2: Support United States participation in international greenhouse gas reduction efforts.***

***ACTION CE2.3: Seek long-term actions by investing in workforce development, partnering with local educators and institutions, and adjusting public policy when warranted by scientific findings.***

### Costs and Funding Opportunities

Resources to engage the community and promote reduction strategies could be pooled from various partnerships in the region including "Climate Bay Area," a new (end of 2009) region-wide clearinghouse for climate action planning throughout the Bay Area. There are currently several organizations and entities who are undertaking different public campaigns. By combining efforts and focusing key and common messages, cities and the County of Napa would likely have little need for additional funding to support this action. Organizations such as Sustainable Napa County, the Napa Valley Farm Bureau, the Napa Valley Vintners, The Community Foundation of Napa Valley and utility companies, among others, have a common message—reduce energy use, drive less, live or operate sustainably. Each of these actions reduces GHG emissions.

The development of the local workforce in Napa necessitates the cooperation and support of all entities, employers and education services, among others. There are funding opportunities available through the American Recovery and Reinvestment Act of 2009 that support communities building a "green collar" job base.

## Emissions Reduction Summary

Given the complexity of current and projected GHG emission calculations and associated funding, proposed actions to reduce GHG emissions by engaging the community and advocating for collaborative policy and legislative actions at regional, state, federal and global levels to reduce GHG emissions, have not been quantifiably assessed to determine potential implementers, feasibility, potential tons of GHG reduced, co-benefits, and estimated investment of each action.

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## Goal 6. Enhance Local Government Operations (LG)

Napa County's five cities' and County's municipal operations generated about 14,700 tons of greenhouse gas in 2005, as shown in the table that follows. Emissions from Napa County municipal operations for all jurisdictions account for about 1.25% of Napa County's total emissions. This percentage falls within the 1-5% range that is typical for California local government emissions, compared with their respective overall community emissions.

As a minor contributor to total emissions, actions to reduce municipal energy use will have a limited impact on Napa County's overall emission levels. However, municipal actions can help reduce local government's operating costs and have an important symbolic value demonstrating government leadership that extends beyond the amount of emissions actually reduced.

Napa local governments follow the Cities for Climate Protection® five-step program for reducing emissions for both municipal operations and community wide. The cities and the County have completed the first step – performing an inventory of their GHG emissions for municipal operations.

The next step is making a plan for reducing emissions in municipal operations such as the County of Napa and City of St. Helena have done. The process of developing such plans involves detailed financial analyses based on the inventory, target, municipal measures completed, underway and planned, and in-depth discussions with staff about the various options for reducing GHG emissions.

The cost for a consultant to complete such a plan depends in part on the size of the operations, which correlates to the population served. For a city like St. Helena, with a population of about 6,000, the cost for a municipal operations climate plan is approximately $17,000. For the County of Napa, with an incorporated area population of about 27,500, the cost for a plan is approximately $40,000. Developing such detailed operational plans for government operations for individual Napa local governments was beyond the scope of this project.

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## GHG Emissions for Municipal Operations 2005 (metric tons of CO2e)

| | Yountville | | Calistoga | | American Canyon | | St Helena | | City of Napa | | County of Napa | | Total Napa Co. Muni Operations | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO2e | % Total | CO2e | % Total | CO2e | % Total | CO2e | % Total | CO2e | % Total | CO2e | % Total | CO2e | % Total |
| Buildings | 138 | 44% | 117 | 14% | 56 | -- | 197 | 19% | 556 | 25% | 4,893 | 51% | 5,957 | 40% |
| Vehicle Fleet | 46 | 15% | 376 | 45% | na | -- | 166 | 16% | 955 | 43% | 1,823 | 19% | 3,366 | 23% |
| Streetlights | 22 | 7% | 31 | 4% | 50 | -- | 66 | 6% | 512 | 23% | | | 681 | 5% |
| Water/Sewage | 106 | 34% | 303 | 37% | 627 | -- | 343 | 34% | 157 | 7% | | | 1,536 | 10% |
| Commute | | | | | | | 247 | 24% | | | 2,879 | 30% | 3,126 | 21% |
| Solid Waste | | | | | | | 3 | 0% | 43 | 2% | | | 46 | 0% |
| | | | | | | | | | | | | | | |
| **Total GHG Emissions** | **312** | | **827** | | **733** | | **1,022** | | **2,223** | | **9,595** | | **14,712** | |

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## Objective LG1: Reduce fossil-fuel consumption by local government operations.

***ACTION LG1.1: Transition government fleets to vehicles powered by clean, renewable energy sources, smaller and more efficient vehicles, and facilitate trip reduction and non-vehicle alternatives.***

***ACTION LG1.2: Install electric vehicle charging stations with funding from State and Federal sources.***

***ACTION LG1.3: Encourage alternatives to employee use of single-occupancy vehicles by providing secure bicycle parking, preferential parking for carpools and vanpools, commuter information, alternative work schedules/practices for government employees and transit incentives.***

***ACTION LG1.4: Adopt hours of operations and schedules for public meetings which are coordinated with public transit service availability.***

## Objective LG2: Improve the energy efficiency and reduce greenhouse gas emissions of City and County facilities and operations.

***ACTION LG2.1: Perform audits and regularly monitor the effectiveness of City and County energy-efficiency implementation measures and adapt them to meet targets.***

***ACTION LG2.2: Convert street lighting, water pumping, water treatment, and other energy-intensive operations to more efficient technologies, and use renewable energy where feasible.***

***ACTION LG2.3: Ensure that new government facilities incorporate cost-effective strategies for reducing greenhouse gas emissions, conserving energy and water, and utilizing sustainable construction practices.***

***ACTION LG2.4: In City and County purchasing decisions, consider carbon emissions from the production, transportation, use, and disposal of goods as a criterion.***

## Objective LG3: Reduce solid waste from City and County operations and facilities.

***ACTION LG3.1: Recover 70% to 85% of all waste generated in City and County operations and establish a user-friendly, comprehensive recycling program that involves all departments and facilities.***

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# Appendix A: Summary Table of Actions

Draft Napa Countywide Community Climate Action Plan Framework

| TRANSPORTATION AND MOBILITY | BUILDINGS AND ENERGY | CONSUMPTION AND SOLID WASTE | AGRICULTURE, NATURAL RESOURCES, AND URBAN FORESTS | COMMUNITY ENGAGEMENT | LOCAL GOVERNMENT OPERATIONS |
|---|---|---|---|---|---|
| **Reduce demand for fossil fuel by decreasing vehicle miles traveled.** | **Reduce energy demand through conservation and efficiency.** | **Achieve overall waste diversion of 75% to 90% by 2020.** | **Encourage responsible and sustainable agricultural and landscaping practices, supporting Local Agriculture, Food Production, and Community Gardens, Promoting Water Conservation** | **Market programs and conduct community outreach to increase participation in GHG reduction efforts.** | **Reduce fossil-fuel consumption by local government operations.** |
| T1.1 Enhance our commitment to urban-centered growth, adopting policies, zoning, and design standards in each jurisdiction to encourage mixed-use, live/work and "walkable," and "bikable" neighborhoods. | BE1.1 Implement an AB811 program, making funding available to residential and commercial property owners seeking to improve their properties to conserve energy and water, and to generate solar energy. | SW1.1 Enact ordinances and create incentives to achieve construction and demolition debris waste diversion of 75% to 90% by 2020. | AN1.1 Adopt policies and ordinances that support local agriculture, food production, and community gardens. Support efforts by local growers and restaurants to produce and use locally grown food products, and remove associated regulatory hurdles. | CE1.1 Partner with community-based non-profit organizations, schools, and others engaged in public outreach and education efforts that broaden community involvement in reducing greenhouse gas emissions. | LG1.1 Transition government fleets to vehicles powered by clean, renewable energy sources, smaller and more efficient vehicles, and facilitate trip reduction and non-vehicle alternatives. |
| T1.2 Maintain or improve the County's overall "balance" of 70,690 jobs and 64,100 employed residents (ration of 1: tto 1) through land use policies and decisions that locate jobs and wage-appropriate housing in proximity to each other. | BE1.2 Pursue State and Federal funding programs designed to reduce energy demand through conservation and efficiency. | SW1.2 Enact ordinances and create incentives to achieve organic (food and green) waste diversion of 75% by 2020, including waste diversion from restaurants and special events | AN1.2 Support efforts by local growers and restaurants to produce and use locally grown food products and remove associated regulatory hurdles. (See also T10 and AN1.) | CE1.2 Partner with utilities, energy service providers and community-based non-profit organizations to encourage participation in incentive programs that improve energy and water efficiency. | LG1.2 Install electric vehicle charging stations with funding from State and Federal sources. |
| T1.3 Require discretionary development projects to assess and mitigate the impacts of vehicle miles traveled through transportation demand management programs including providing transit amenities. | BE1.3 Require or request discretionary development projects to assess greenhouse gas emissions due to energy use, and to incorporate energy and water conservation measures into projects | SW1.3 Create and support other programs, such as the Napa County Green Business Program, that help achieve the 75% to 90% overall waste diversion goal. | AN1.3 Adopt water efficient landscape ordinances that promote climate-appropriate plants, efficient irrigation, and non-potable water sources. | CE1.3 Partner with public agencies, non-profit organizations and private employers to offer incentives aimed at reducing drive-alone commuting and promoting car-free tourism. | LG1.3 Encourage alternatives to employee use of single-occupancy vehicles by providing secure bicycle parking, preferential parking for carpools and vanpools, commuter information, alternative work schedules/practices for government employees and transit incentives. |
| T1.4 Evaluate truck and freight rail routes and, based on these findings, develop policies and strategies that improve circulation and address neighborhood compatibility issues. | **Reduce the Growth of Electricity and Natural Gas Use** | SW1.4 Adopt environmentally preferable purchasing policies and explore joint-purchasing agreements with partner agencies, and local jurisdictions and businesses. | **Reduce water use and protect local water resources. Reducing demand of potable water and developing water service and infrastructure** | CE1.4 Promote programs designed to advance sustainable business practices, such as the Napa County Green Business Program and sustainable agricultural practices, such as the Napa Green Certified Land Program. | LG1.4 Adopt hours of operations and schedules for public meetings which are coordinated with public transit service availability. |
| T1.5 Adopt and implement the NCTPA Strategic Transportation Plan to increase transit service and ridership throughout Napa County. | BE1.4 Implement improved energy conservation (Title 24) standards for new buildings starting in January 2010, and before 2011 adopt enhanced green building ordinances that meet or exceed the 2010 California Green Building Standards. | SW1.5 Establish collection services in all cities for segregated food waste from commercial sources and establish a local food composting facility. | AN2.1 Develop and implement water conservation plans that include financial incentives, educational programs, and ordinances that reduce the per capita demand of potable water. | **Engage and advocate for collaborative policy and legislative actions at regional, state, federal and global levels to reduce GHG emissions.** | **Improve the energy efficiency and reduce greenhouse gas emissions of City and County facilities and operations.** |
| T1.6 Complete a multi-use countywide Class 1 trail from Calistoga to American Canyon (also known as the Napa Valley Vine Trail), and adopt and implement pedestrian and bicycle networks within each city and town that connect to it. | BE1.5 Adopt policies and ordinance changes to reduce energy use by promoting domestic water conservation and requiring water efficient landscape improvements associated with new construction. (See also AN1.3 and AN2.1.) | SW1.6 Encourage home composting of organic waste. | AN2.2 Develop and enhance recycled water service and infrastructure to serve all areas of Napa County. | CE2.1 Engage and assist local agencies and utility companies toward achieving greenhouse gas reduction targets. | LG2.1 Perform audits and regularly monitor the effectiveness of City and County energy-efficiency implementation measures and adapt them to meet targets. |
| T1.7 Maintain and enhance existing express bus, local bus and paratransit services, establish a northbound upvalley express bus during peak commute hours, and complete construction of a major transit center in central Napa. | **Improve the energy supply by switching from fossil fuels to renewables.** | | **Protect and increase the amount of vegetation and biomass in soil and reduce emissions from agricultural sources.** | CE2.2 Support United States participation in international greenhouse gas reduction efforts. | LG2.2 Convert street lighting, water pumping, water treatment, and other energy-intensive operations to more efficient technologies, and use renewable energy where feasible. |
| T1.8 Expand Park and Ride areas and other support facilities to encourage public transportation use and car and van pooling. | BE2.1 Increase local renewable energy generation such that the County will always generate more than 15 watts of renewable energy per capita. | | AN3.1 Support and promote the Napa Green Certified Winery Program and the Napa Green Certified Land Program ("Fish Friendly Farming"), as well as other practices. | CE2.3 Seek long-term actions by investing in workforce development, partnering with local educators and institutions, and adjusting public policy when warranted by scientific findings. | LG2.3 Ensure that new government facilities incorporate cost-effective strategies for reducing greenhouse gas emissions, conserving energy and water, and utilizing sustainable construction practices. |
| T1.9 Study rail and bus rapid transit options in the Highway 29 corridor between Vallejo and downtown Napa, and in the Highway 12 corridor between Fairfield and central Napa. Plan for the phased implementation of transit improvements with the goal of bus rapid transit between Vallejo ferry and the Fairfield and central Napa transit centers. | BE2.2 Adopt policies and ordinances to remove regulatory impediments and economic disincentives associated with the generation and use of energy from renewable sources such as wind, geothermal, and solar energy. | | AN3.2 Assess the positive or negative impacts of land use changes, new vineyards, and urban development on carbon sequestration. | | LG2.4 In City and County purchasing decisions, consider carbon emissions from the production, transportation, use, and disposal of goods as a criterion. |
| T1.10 Implement programs that encourage car-free tourism such as zero emission shuttle services during peak weekends and special events. | | | AN3.3 Adopt policies, ordinances, and plans that create and enhance urban forests and greenways. | | **Reduce solid waste from City and County operations and facilities.** |
| **Improve the overall fuel efficiency of the transportation system** | | | AN3.4 Adopt policies and ordinances to protect habitat and mitigate the conversion of oak woodlands and other important plant communities by permanently protecting similar habitats. | | LG3.1 Recover 70% to 85% of all waste generated in City and County operations and establish a user-friendly, comprehensive recycling program that involves all departments and facilities. |
| T1.11 Improve the fuel efficiency of the public street system by optimizing signal timing on arterials, improving street connections and reducing circuitous routes. | | | | | |
| **Reduce the average length of trips** | | | | | |
| T1.12 To reduce vehicle miles, adopt policies and ordinance changes that facilitate working at home, and support local hiring, food production, farmers markets, and community-based "buy local" campaigns. (See also AN1 and AN4.) | | | | | |
| **Reduce the total number of trips** | | | | | |
| T1.13 Develop parking strategies in downtown areas to help reduce vehicle miles traveled. | | | | | |
| T1.14 Implement transportation demand management (TDM). | | | | | |
| **Encourage and support the switch from fossil-fuel powered vehicles to renewable energy powered vehicles.** | | | | | |
| T2.1 Adopt consistent policies and programs that help businesses and organizations with fossil-fuel powered fleet vehicles switch to vehicles powered by clean, renewable energy sources. (See also LG1.) | | | | | |

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| Objectives | Implementer | Feasibility | Potential Metric Tons GHG Reduced | Estimated Investment | Investment per Metric Ton GHG Reduced |
|---|---|---|---|---|---|
| Objective TM1 Reduce demand for fossil fuel by decreasing vehicle miles traveled | | | | | |
| Slowing down the anticipated growth rate of new vehicle miles traveled *(Actions TM1.1, TM1.2, TM1.3, TM1.4, TM1.5)* | All Jurisdictions, NCTPA | Moderate | 25,000 or 6% of total target reduction | Nominal – these are mostly planning actions and regulatory changes | Nominal |
| Increasing the number of people using transit, walking or biking*(Actions TM1.5, TM1.6, TM1.7, TM1.8, TM1.9, TM1.10)* | All Jurisdictions, NCTPA | Challenging | 40,000 or 9% of total target reductions | Expand Bus service: $10M<br>VineTrail: $32-48M<br>Park and Ride Lots: $3M<br>Tourist Shuttles: unknown | $1,125 to $1,525 per ton of GHG reduced |
| Improving the overall fuel efficiency of the transportation system (Action TM1.11) | All Jurisdictions, NCTPA, EPA and CARB | Easy (reductions due mostly to CA Clean Car Law) | 80,000 or 18% of target reduction | Improved traffic signalization and flow: $1M | (efficiency improvements due to traffic signalization alone not determined) |
| Reduce length of trips (Action TM 1.12 | All Jurisdictions, NCTPA | Moderate | Difficult to quantify | Nominal – these are predominantly planning actions and regulatory changes | Nominal |
| Reduce # of trips (actions TM 1.13,TM 1.14) | All Jurisdictions, NCTPA | Moderate | Difficult to quantify | Nominal – these are predominantly planning actions and regulatory changes | Nominal |
| Objective TM2 Encourage and support the switch from fossil-fuel powered vehicles to renewable energy powered vehicles. | | | | | |
| ACTION TM2.1: Adopt consistent policies and programs that help businesses and organizations with fossil-fuel powered fleet vehicles switch to vehicles powered by clean, renewable energy sources. (See also LG1.) | All Jurisdictions, NCTPA | Moderate | To be determined | Nominal – these are predominantly planning actions and regulatory changes | Nominal |

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| Objectives | Implementer | Notes and Assumptions | Potential Metric Tons GHG Reduced from BAU | Estimated Investment | Annual Savings (electricity & NG costs avoided) | Investment per Metric Ton GHG Reduced |
|---|---|---|---|---|---|---|
| Objective BE1: Reduce energy demand through conservation and efficiency. | | | | | | |
| Improving the efficiency of existing buildings *(Actions BE1.1, BE 1.2, BE 1.3)* | All Jurisdictions (Implement AB811 Program) | Assumes 60% of residential households participate and improve efficiency by 40% per household | 27,000 metric tons or 6% of target reduction | $133 million *(residential only)* or annual repayment cost of $12.5 million (financed at 7% over 20 yrs) | $11.5 million annually (annual savings does not include projected utility rate escalation) | Program is revenue neutral (annual cost roughly equal to annual savings assuming rate escalation) |
| | Community Choice Aggregator (CCA) | Assumes implementation of alternative appliance rebate programs (appliances not covered by AB811 program) | 5,000 metric tons or 1% of target | $39 million (annual repayment of $3.7 million financed at 7% over 20 yrs. Repayment amount represents end-user costs only other 50% is funded through electric rate) | $3.7 million annually | Program is revenue neutral (annual cost roughly equal to annual savings) |
| | Municipal Water Utility (e.g. water utility could cover all other water using appliances not covered by AB811) | High performance efficiency programs that eliminates upfront purchase costs and indebtedness (e.g. PAYS program) | 30,000 metric tons or 6% of target (assumes 80% uptake and 60% efficiency improvement. Renters are also eligible) | $102 million (annual repayment of $9.7 million financed at 7% over 20 yrs) | $9.6 million annually | Program is revenue neutral (annual cost roughly equal to annual savings) |
| Reducing the growth of electricity and natural gas use *(Actions BE1.4, BE1.5)* | All Jurisdictions (e.g. implement green building ordinances) | Less than 3% of total emissions in 2020 are due to growth in electricity and natural gas. This growth will be reduced even further by Title 24 changes. | up to 15,000 metric tons or 3% of target reduction | Costs depend on development | Savings depend on development | Higher purchase prices for high efficiency buildings are recoverable by owner over time. |

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| Solid Waste | Implementer | Feasibility | Potential tons GHG reduced by 2020 |
|---|---|---|---|
| Objective SW1. Achieve overall waste diversion of 75% to 90% by 2020. | | | |
| Increasing overall waste diversion (Action SW1.1) | UVWMA, N-VWMA, County, cities | Moderate | 90,000 tons/year (reductions not counted toward target) |
| Reducing the amount of waste generated (Action SW 1.2) | UVWMA, N-VWMA, County, cities | Easy to Difficult | To be determined |
| Reusing products and packaging (Action SW1.3) | UVWMA, N-VWMA, County, cities | Moderate | To be determined |
| Recycling or composting (Action SW1.5, SW1.6) | UVWMA, N-VWMA, County, cities | Moderate | 3,700 tons/year (reductions not counted toward target) |

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# Appendix B: Inventory of Napa County Greenhouse Gas Emissions

Napa Countywide Community Carbon Footprint

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| TABLE 1: 2005 NAPA COUNTY GHG EMISSIONS (metric tons of CO2 equivalents) | Yountville | % Town Total | Calistoga | % City Total | St. Helena | % City Total | American Canyon | % City Total | City of Napa | % City Total | Unincorp Napa Cnty | % Unincorp Total | | Total Napa County | % Napa County |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Residential Buildings | 3,765 | 13% | 7,758 | 27% | 10,781 | 23% | 19,819 | 22% | 106,003 | 23% | 48,224 | 9% | | 196,350 | 16% |
| Commercial & Industrial Buildings | 14,032 | 50% | 7,062 | 25% | 17,458 | 38% | 21,672 | 24% | 71,120 | 16% | 95,317 | 17% | | 226,661 | 19% |
| Transportation | 7,424 | 26% | 8,704 | 31% | 8,452 | 18% | 40,479 | 44% | 221,901 | 49% | 349,764 | 63% | | 636,724 | 53% |
| Lawn & Garden Equipment | 79 | 0% | 151 | 1% | 178 | 0% | 346 | 0% | 2,109 | 0% | 753 | 0% | | 3,616 | 0% |
| Construction & Industrial/Commercial Equipment | 1,858 | 7% | 1,949 | 7% | 4,061 | 9% | 1,660 | 2% | 24,277 | 5% | 15,870 | 3% | | 49,675 | 4% |
| Agriculture/Farming | 38 | 0% | 132 | 0% | 769 | 2% | 4 | 0% | 286 | 0% | 31,817 | 6% | | 33,046 | 3% |
| Solid Waste | 1,109 | 4% | 2,671 | 9% | 4,353 | 9% | 7,469 | 8% | 29,366 | 6% | 9,241 | 2% | | 54,209 | 5% |
| **TOTAL 2005 GHG EMISSIONS PER JURISDICTION** | **28,305** | | **28,427** | | **46,052** | | **91,449** | | **455,062** | | **550,986** | | | **1,200,281** | |
| **% COUNTYWIDE GHG EMISSIONS** | **2%** | | **2%** | | **4%** | | **8%** | | **38%** | | **46%** | | | **100%** | |

| TABLE 2: 2005 GHG EMISSIONS PER CAPITA/HOUSEHOLDS/JOBS (metric tons of CO2 equivalents) | Yountville | % Napa County | Calistoga | % Napa County | St. Helena | % Napa County | American Canyon | % Napa County | City of Napa | % Napa County | Unincorp Napa Cnty | % Napa County | | Total Napa County | % Napa County |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Population (ABAG 2005) | 3,400 | 3% | 5,200 | 4% | 6,100 | 5% | 14,200 | 11% | 76,600 | 57% | 28,600 | 21% | | 134,100 | 100% |
| Households (ABAG 2005) | 1,080 | 2% | 2,060 | 4% | 2,430 | 5% | 4,710 | 10% | 28,750 | 58% | 10,260 | 21% | | 49,290 | 100% |
| Jobs (ABAG 2005) | 2,700 | 4% | 2,830 | 4% | 2,700 | 4% | 2,410 | 3% | 35,260 | 51% | 23,050 | 33% | | 68,950 | 100% |
| | | | | | | | | | | | | | | | |
| **TOTAL EMISSIONS PER CAPITA** | **8.33** | | **5.47** | | **7.55** | | **6.44** | | **5.94** | | **19.27** | | | **8.95** | |
| **RESIDENTIAL EMISSIONS PER CAPITA** | **1.11** | | **1.49** | | **1.77** | | **1.40** | | **1.38** | | **1.69** | | | **1.46** | |
| **RESIDENTIAL & GARDEN EMISSIONS PER HOUSEHOLD** | **3.56** | | **3.84** | | **4.51** | | **4.28** | | **3.76** | | **4.77** | | | **4.06** | |
| **COMMERCIAL/INDUSTRIAL EMISSIONS PER JOB** | **5.89** | | **3.18** | | **7.97** | | **9.68** | | **2.71** | | **4.82** | | | **4.01** | |

| TABLE 3: 2005 ANNUAL VEHICLE MILES TRAVELED (Caltrans HPMS) | Yountville | % Napa County | Calistoga | % Napa County | St. Helena | % Napa County | American Canyon | % Napa County | City of Napa | % Napa County | Unincorp Napa Cnty | % Napa County | | Total Napa County | % Napa County |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Local Roads-Annual Vehicle Miles Traveled (1,000's) | 2,387 | 1% | 5,873 | 1% | 7,742 | 2% | 26,141 | 6% | 218,953 | 49% | 186,453 | 42% | | 447,548 | 100% |
| State Highways: Annual Vehicle Miles Traveled (1,000's) | 10,060 | 2% | 8,721 | 1% | 6,431 | 1% | 41,730 | 7% | 153,115 | 25% | 400,001 | 65% | | 620,059 | 100% |

| TABLE 4: 2020 GHG EMISSIONS FORECAST (metric tons of CO2 equivalents) | Yountville | % Change 2005-2020 | Calistoga | % Change 2005-2020 | St. Helena | % Change 2005-2020 | American Canyon | % Change 2005-2020 | City of Napa | % Change 2005-2020 | Unincorp Napa Cnty | % Change 2005-2020 | | Total Napa County | % Change 2005-2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Residential Buildings | 4,288 | 14% | 8,022 | 3% | 11,225 | 4% | 27,393 | 38% | 117,765 | 11% | 51,232 | 6% | | 219,924 | 12% |
| Commercial & Industrial Buildings | 15,019 | 7% | 7,486 | 6% | 18,139 | 4% | 59,261 | 173% | 85,279 | 20% | 107,599 | 13% | | 292,783 | 29% |
| Transportation | 9,293 | 25% | 10,896 | 25% | 10,580 | 25% | 50,672 | 25% | 277,777 | 25% | 437,836 | 25% | | 797,054 | 25% |
| Lawn & Garden Equipment | 90 | 14% | 156 | 3% | 185 | 4% | 478 | 38% | 2,343 | 11% | 800 | 6% | | 4,053 | 12% |
| Construction & Industrial/Commercial Equipment | 1,989 | 7% | 2,066 | 6% | 4,219 | 4% | 4,539 | 173% | 29,110 | 20% | 17,915 | 13% | | 59,839 | 20% |
| Agriculture/Farming | 38 | 0% | 132 | 0% | 769 | 0% | 4 | 0% | 286 | 0% | 31,817 | 0% | | 33,046 | 0% |
| Solid Waste | 1,207 | 9% | 2,722 | 2% | 4,424 | 2% | 10,046 | 35% | 32,011 | 9% | 9,790 | 6% | | 60,201 | 11% |
| **TOTAL 2020 GHG EMISSIONS PER JURISDICTION** | **31,924** | 13% | **31,480** | 11% | **49,541** | 8% | **152,393** | 67% | **544,572** | 20% | **656,989** | 19% | | **1,466,900** | 22% |
| **% COUNTYWIDE GHG EMISSIONS** | **2%** | | **2%** | | **3%** | | **10%** | | **37%** | | **45%** | | | **100%** | |

| TABLE 5: 2020 AB32 TARGET REDUCTIONS (15% reduction from 2005 baseline) | 2005 Baseline | 2020 Forecast | 2020 AB32 Target (1990 estimated) | CO2e Reduced | % CO2e Reduced |
|---|---|---|---|---|---|
| Yountville | 28,305 | 31,924 | 24,059 | 7,865 | 25% |
| Calistoga | 28,427 | 31,480 | 24,163 | 7,317 | 23% |
| St. Helena | 46,052 | 49,541 | 39,144 | 10,397 | 21% |
| American Canyon | 91,449 | 152,393 | 77,732 | 74,662 | 49% |
| City of Napa | 455,062 | 544,572 | 386,803 | 157,769 | 29% |
| Unincorporated Napa County | 550,986 | 656,989 | 468,338 | 188,651 | 29% |
| **TOTAL NAPA COUNTY** | **1,200,281** | **1,466,900** | **1,020,239** | **446,661** | **30%** |

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# Appendix C: Methodology – ICLEI

ICLEI Local Governments for Sustainability

## Community Greenhouse Gas Inventory Methodology for Bay Area Local Governments

Prepared as part of Bay Area Air Quality Management District -- ICLEI Workshop Napa County on November 18, 2008

### Community-Scale Inventory: Introduction

The community-scale inventory estimates the quantity of greenhouse gas (GHG) emissions for which the community as a whole is responsible for a specific analysis year. The community inventory is organized by scope (see definition below) and sector—residential, commercial, industrial, transportation/mobile emissions, and waste. When completed, the community inventory will include the quantities of electricity and fuels used in the residential, commercial, industrial, and transportation/mobile emissions sectors, along with the amount of waste produced and landfilled in the analysis year, as well as the quantity of GHG emissions produced by each of these sectors. The data needed is typically available from electric and gas utilities, planning and transportation agencies and solid waste management departments. *See sector detail for data sources, methodologies, and emissions coefficients.*

#### *Purposes of an Emissions Inventory*

Each local community has unique characteristics (e.g., population, housing types, transportation networks, industries, electricity fuel mix) that make its GHG inventory different from other cities or counties. Therefore, the primary values of an emissions inventory are:

- To determine the major sources of emissions within your jurisdiction as a basis for effective emissions reduction policy,
- To create a base year to set emissions reduction targets, and
- To enable the demonstration of progress over time through re-inventorying across years.

For this Community Inventory Workshop, all participating local governments will use data provided by common sources. However, each local government may choose to supplement this analysis with additional data sources of greenhouse gas emissions to analyze on their own.

#### *Inventories as Estimates*

This emissions inventory represents a useful tool for creating a quantitative understanding of emissions form your jurisdiction, for creating a basis for effective policies to reduce emissions, and for creating a baseline to compare against future inventories. This said, this inventory represents a best estimate based upon current understanding and data and does not represent a complete and unchanging picture of emissions in your jurisdiction. It is important to communicate this fact to policymakers, staff and community members throughout the inventory process.

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Inventories will evolve for two reasons. First, in many of the sectors of the inventory, the science, models, and data infrastructure behind available data are continually evolving. For this reason, available data and emissions factors are continually being refined and made more accurate. In addition, national community-scale emissions inventory standards have yet to be officially established, and methods used for inventories now may not be those adopted in a final Protocol (expected completion Fall 2009). It is therefore important to understand and communicate that this and all inventories represent an estimate based upon best available data and methodologies, and are subject to change over time.

## Community-Scale Inventory: Contents and General Data Needs

### *General Data Requirements*

Emission factors (also referred to as emission coefficients) and activity level data, typically framed as the amount of energy consumed or waste generated, are needed to calculate emissions resulting from that activity. Emission factors describe the quantity of a pollutant emitted for every unit of activity.

Activity Level Data x Emissions Factor = Emissions Generated from Activity

ICLEI recommends converting all GHG emissions into carbon dioxide equivalent units, or $CO_2e$, per the international convention of using global warming potentials outlined in the IPCC's Second Assessment Report (SAR). However, this convention may change in the future as international consensus shifts to using the values identified in the third assessment report. See Appendix A for more information.

### *Emissions Sources that are Included*

The community-wide analysis includes the following data sources and sectors:

| | Sector | Data / Emission Source | | Sector | Data / Emission Source |
|---|---|---|---|---|---|
| **Built Environment** | Residential | *Electricity Consumption* | **Mobile Emissions** | On-Road Transportation | *Vehicles on Local Roads* |
| | | *Natural Gas Consumption* | | | *Vehicles on State Highways* |
| | Commercial | *Electricity Consumption* | | Off Road Non-Point Sources | *Lawn and Garden Equipment* |
| | | *Natural Gas Consumption* | | | *Construction Equipment* |
| | Industrial | *Electricity Consumption* | | | *Industrial Equipment* |
| | | *Natural Gas Consumption* | | | *Light Commercial Equipment* |
| | | *Estimated Direct Access Natural Gas Consumption* | **Waste** | Landfill Methane | *Methane ($CH_4$) emissions from landfills* |
| | | *Estimated Direct Access Electricity Consumption* | | Community Generated Waste | *Total Landfill Waste* |
| | | | | | *Total Organic Alternative Daily Cover* |

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### *Emissions Sources that are Excluded*

Local governments should endeavor to include all possible emissions sources in their community-scale inventories. However, local governments will often choose to exclude emissions sources that meet the following criteria:

- *Small and unimportant* – Emissions sources can be excluded from the analysis (e.g. are "de minimis") if, when combined, the excluded emissions total less than 5% of the total of the emissions from the Community or Government Inventory.[1]
- *Prohibitively difficult to track with accuracy or lack necessary data to calculate* –The science is still evolving in many sectors, and data may not be available-e.g. Non-combustion industrial emissions sources, emissions from composting activities.
- *Largely located outside the jurisdiction's boundaries* – such as intercity transportation fuel (i.e. air, rail, marine and intercity highway traffic).

## Community-Scale Inventory: Reporting Emissions

### *Scopes*

The scopes framework is designed to categorize emissions according to source location and the ability of local governments to affect their emissions. ***Scopes must be reported separately, as adding scopes may result in double counting.*** If your jurisdiction chooses to report one "roll-up" number for all emissions *in addition to reporting separately by Scope*, it is important to account for double counting by removing overlapping emissions (if possible), and clearly state exactly what emissions sources were aggregated to create the roll up number whenever mentioning it. In this inventory, the only source of possible double counting is in the waste sector, where community generated waste may be disposed of in a landfill within the jurisdiction, leading to Scope 1 and Scope 2 emissions. Depending upon the source of waste in a landfill, it may be very difficult to separate out emissions resulting from waste generated within the community versus emissions from waste generated outside of the community. For this reason, ICLEI strongly recommends reporting emissions by Scope for the Napa County inventories.

Scope 1 emissions sources within the context of community-scale emissions analyses include all direct emissions generated during the analysis period within the community boundaries. For the purposes of this inventory, Scope one emissions include point source emissions such as natural gas and diesel consumption in homes and businesses, and methane released from decomposing waste in landfills within the jurisdiction. It also includes emissions from vehicles and other non-point sources within the local government boundaries.

Scope 2 emissions sources within the context of community-scale emissions analyses include all emissions generated during the analysis period outside the community's geographic boundaries but due to activity occurring inside the boundaries. In this inventory, Scope two sources are limited to the electricity consumed in homes and businesses within local government boundaries.

[1] Note: an inventory should include at least 95% of the emissions released by the government and community as a whole. Therefore, if a large number of small emissions sources occur within the jurisdiction, they cannot all be ignored.

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Scope 3 emissions sources within the context of community-scale emissions analyses include additional potentially policy-relevant emissions data that does not fit within the above scope definitions. In this inventory, emissions resulting from community-generated waste sent to landfills is considered a scope three emission (pending adoption of the Community-Scale Emissions Protocol).

***Forecasting Emissions***

ICLEI encourages forecasting emission to a projected target year (most often 2020) to create a more accurate picture of the emission reductions necessary to meet your jurisdiction's targets. Because of population increase, as well as growth in the jobs and transportation sectors, emissions will experience a background change not related to policy changes made by the local government. When creating an emissions reduction target, it is therefore important to consider not only emissions in the base year, but projected emissions in the target year, as these will need to be accounted for as well.

To assist in the forecast, ICLEI has included a forecasting tool as part of the master data summary file that was created for your jurisdiction. ICLEI has included Household, Population, and Job forecasts from ABAG's policy-based *Projections 2005* for you to use in your jurisdictions forecast if so chosen. Many local governments have conducted their own forecasts as part of General Plan or other processes and may wish to use this information instead. See more details on the methodology of the forecast tool in Appendix B.

## Built Environment: Residential, Commercial and Industrial Sectors

***Data Sources***

- Utility electricity and natural gas consumption for 2005 was provided by Corie Cheeseman at PG&E. Data is reported at an aggregate level for each sector – Residential, Commercial and Industrial (Commercial and Industrial are often bundled together for reasons stated below.)
- Countywide Direct Access electricity consumption (purchased directly from the power generator, not through PG&E) for Napa County was obtained from Andrea Gough at the California Energy Commission.

***Methodology***

- Utility (PG&E) electricity and natural gas consumption was converted to emissions using PG&E emissions factors below.
- Industrial customers are subject to State PUC confidentiality laws (15/15 rule) if they consume a certain proportion of the electricity within the local government. For this reason, all Napa County jurisdictions had at least a portion of the industrial consumption reported in the commercial sector and any reported emissions from the industrial sector constitute only a subset of actual industrial emissions.
- The Direct Access (DA) data used for these emissions inventories (provided by the CEC-- see above) are aggregated at the countywide level. Direct Access electricity consumption at the municipal level was estimated by assigning the countywide ratio of DA electricity to

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PG&E electricity to all cities and towns. This ratio, applied to known PG&E electricity at the municipal level, generates the DA consumption estimate. The DA estimate is then converted to $CO_2e$ emissions using emissions factors below.

***2005 Emission Factors:***

| Emission Source | GHG | Emission Factor | Emission Factor Source |
|---|---|---|---|
| **PG&E Delivered Electricity** | $CO_2e$ | 0.492859 lbs/ kwh | The certified 2005 CO2e emission factor for delivered electricity was given to ICLEI by Xantha Bruso at PG&E. |
| **Default Direct Access Electricity*** | $CO_2$ | 343.3 short tons/ GWh | ICLEI/Tellus Institute (2005 Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Coefficients) |
| | $CH_4$ | 0.035 short tons/ GWh | |
| | $N_20$ | 0.027 short tons/ GWh | |
| **Natural Gas** | $CO_2$ | 53.05 kg/ MMBtu | PG&E/CCAR. Emission factors are derived from: California Energy Commission, Inventory of California Greenhouse Gas Emissions and Sinks: 1990-1999 (November 2002); and Energy Information Administration, Emissions of Greenhouse Gases in the United States 2000 (2001), Table B1, page 140. |
| | $CH_4$ | 0.0059 kg/ MMBtu | CCAR. Emission factors are derived from: U.S. EPA, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2000" (2002), Table C-2, page C-2. EPA obtained original emission factors from the Intergovernmental Panel on Climate Change, Revised IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual (1996), Tables 1-15 through 1-19, pages 1.53-1.57. |
| | $N_20$ | 0.001 kg/ MMbtu | |

***What is not included in this data?***

- Fuel sources not delivered by PG&E. For example, wood, charcoal, propane, kerosene, diesel, heavy fuel oil, etc. In California, this largely results in an exclusion of industrial process emissions.
- PFCs, HFCs, $SF_6$. This data may be prohibitively difficult to obtain.

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## Transportation/Mobile Emissions Sector

***Data Sources***

- Local Roads 2005 VMT data was obtained from CalTrans, which compiles and published statewide VMT data annually through the Highway Performance Monitoring System.[2] CalTrans obtains local roads VMT data from regional transportation planning agencies and councils of governments across the state. For the San Francisco Bay Area, CalTrans obtains data from the Metropolitan Transportation Commission (MTC). MTC obtains data on local roads VMT either from the local governments within its jurisdiction or, if that data is unavailable, through a CalTrans model.
- State Highways Vehicle Miles Traveled (VMT) 2005 data was also obtained from CalTrans, with daily VMT by road segment.
- Off Road non-point source emissions were obtained by Walter Wong, California Air Resources Board, wwong@arb.ca.gov

***Methodology***

- State Highway VMT data by road segment was translated to the jurisdiction level data through a GIS analysis by Jonathan Strunin, Program Officer at ICLEI. Road segments were split into jurisdictions and, where road segments crossed jurisdiction boundaries, the percentage of each road segment in a jurisdiction was calculated. This percentage was then applied to the VMT figure for the road segment.

  Percentage of Road Segment in Jurisdiction x VMT for Road Segment = VMT for Road Segment in Jurisdiction

  These VMT figures were then aggregated by jurisdiction.
- $CO_2$ emissions were calculated from VMT using regional EMFAC figures including: VMT mix, fuel efficiencies (to convert VMT to fuel consumption), and local emission factors (to convert fuel usage to emissions).
- $CH_4$ and $N_2O$ emissions were calculated from VMT using the $CH_4$ and $N_2O$ emissions coefficients below.
- Emissions from off-road non-point sources for Napa County were calculated from the California Air Resources Board OFFROAD2007 model.[3] Countywide figures were then split into jurisdictions using 2005 household and job estimates from ABAG *Projections 2005*.

[2] The 2005 report is available at: http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2005PRD.pdf.
[3] For a detailed description of the OFFROAD2007 model methodology and included emissions sources, see http://www.arb.ca.gov/msei/offroad/pubs/offroad_overview.pdf

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***2005 Emissions Factors:***[4]

| $CH_4$ Rates (grams/mile) | | $N_2O$ Rates (grams/mile) | | VMT Mix | | $CO_2$ Rates- (grams/gallon) | | Fuel Efficiency (miles/gallon) | |
|---|---|---|---|---|---|---|---|---|---|
| Gas | Diesel | Gas | Diesel | Gas | Diesel | Gas | Diesel | Gas | Diesel |
| 0.074 | 0.033 | 0.070 | 0.050 | 93.4% | 6.6% | 8,561 | 10,126 | 117.6 | 9.1 |

***What is not included in this data?***

- Emissions associated with port or airport operations.
- Rail transit emissions.
- This methodology will not reflect the use of any fuels besides gasoline and diesel.
- PFCs, HFCs, $SF_6$. This data may be prohibitively difficult to obtain.

## Waste Sector

***What is included in this data?***

1) Landfill Emissions
   - Total captured and fugitive emissions (methane emissions) released from any landfills located in your jurisdiction in the baseline year
2) Lifetime Decomposition Associated with Waste Generated
   - Total emissions (methane emissions) from solid waste generated in your jurisdiction in the baseline year that was sent to landfills regardless of whether they are located within or outside of your jurisdiction's boundaries
   - Total emissions (methane emissions) from the Alternative Daily Cover (ADC) used in the landfills where the waste generated in your jurisdiction is disposed.

***What is not included in this data?***

- Any GHG emissions from fossil-based products (incineration or decomposition) are not included nor are GHG emissions from organic waste handling and decay because they are considered to be biogenic in origin.

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[4] Emissions Factors Source: Bay Area Air Quality Management District (BAAQMD). $CO_2$, $CH_4$ and $N_2O$ emission factors are generated using the EMFAC model. The basis for the estimates are $CO_2$ emission rates (grams/mile), which are based on engine testing at different speeds, and county-wide vehicle registration data obtained from DMV. Estimates are available for years 1970-2040. The model also provides estimates of criteria air pollutants, as well as methane emissions ($CH_4$). In addition, it produces an estimate of fuel usage, and fuel economy. County variations in emission factors are due to the use of county-specific vehicle usage, vehicle mix, vehicle speed and ambient temperatures. For more information on EMFAC2007, please refer to California Air Resources Board website:
http://www.arb.ca.gov/msei/onroad/latest_version.htm
Contact: Abby Young, Principal Environmental Planner, BAAQMD, ayoung@baaqmd.ca.gov

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***Emission Factors and Calculation Methodology:***

1) Total Emissions Generated: Landfill Gas Collection figures were provided by the Bay Area Air Quality Management District for the two permitted landfills located within Napa County. Landfill gas recovery (75%), methane destruction efficiency, and other determining factors were provided by the Local Government Operations Protocol (Chapter 9).
2) Lifetime Decomposition Associated with Waste Generated: The methane emission factors used in the ICLEI CACP Software were derived from the EPA WARM model. For quantification of emissions, only methane generation (or gross emissions) is taken into account. More information on the WARM Model is available at: http://epa.gov/climatechange/wycd/waste/calculators/Warm_home.html. In line with the Local Government Operations Protocol, a 75% methane recovery factor is applied.

***Data Sources:***

1) Landfill information and total landfill waste in place: Bay Area Air Quality Management District (BAAQMD).
   Contact: Carol Allen, BAAQMD, callen@baaqmd.gov
2) Waste Tonnage: California Integrated Waste Management Board (CIWMB), California Solid Waste Statistics.
   Waste disposal and alternative daily cover (ADC) tonnage is reported by permitted facility operators and compiled by county/regional agency disposal reporting coordinators and published in the Disposal Reporting System (DRS) for every county/jurisdiction from 1999 to 2005 (as of September 2007) by the California Integrated Waste Management Board.
   http://www.ciwmb.ca.gov/lgcentral/DRS/Reports/JurDspFa.asp?VW=JURIS

   **Upper Valley Waste Management Authority**
   Waste tonnage of municipalities and unincorporated areas that are part of the Upper Valley Waste Management Authority (UVWMA) were estimated by disaggregating the UVWMA annual data (provided by the CIWMB DRS). The percentage that a given UVWMA jurisdiction generated was based upon the number of Upper Valley Disposal and Recycling (UVDS) accounts in each jurisdiction.
   Data provided by Amy Garden, Napa County Environmental Management, AGARDEN@co.napa.ca.us; and Linda Sereni, Upper Valley Disposal and Recycling, Linda@uvds.com.

   Waste Characterization: CIWMB 2004 Statewide Waste Characterization Study. This state average waste characterization accounts for residential, commercial and self haul waste. http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097
   Residential and Commercial Waste Characterization Studies are provided every five years by county/jurisdiction. The CIWMB does not compile the sector-specific tonnage of waste generated. Therefore, this characterization is only usable if every jurisdiction has the exact tonnage per sector. http://www.ciwmb.ca.gov/Profiles/Juris/Default.asp

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| | Unit | CH4 Coefficient by Waste Type | | | | |
|---|---|---|---|---|---|---|
| | | Paper Products | Food Waste | Plant Debris | Wood/Textiles | All Other Waste |
| **Methane Emissions** | (tonne/tonne of waste disposed) | 2.1382629 | 1.210337 | 0.685858 | 0.605168736 | 0 |

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## Appendix A-Global Warming Potentials and CO2e

When reporting GHG emissions and reductions, the individual gases are typically converted to carbon dioxide equivalencies ($CO_2e$) in order to report a single number that captures the total amount of GHG being released (or avoided).

Carbon dioxide equivalent ($CO_2$ e) is a commonly used unit that allows amounts of greenhouse gases of different strengths to be added together based on each gas's relative impact on climate change. $CO_2$ e is expresses in terms of the amount of carbon dioxide it would take to produce the same impact on global climate change. For example, nitrous oxide is 310 times more potent than carbon dioxide as a greenhouse gas. Therefore, one ton of $N_2O$ is equal to 310 tons $CO_2e$. This conversion factor is known as the gas's "global warming potential." The global warming potential is calculated based on a 100 year time frame, taking into consideration both impact and the length of time the gas remains in the atmosphere (i.e. a more potent greenhouse gas that is removed from the atmosphere in 10 years could have a lower global warming potential than a weaker gas that remains in the atmosphere for 50 years).

**Relative Global Warming Potentials from the IPCC's Second (SAR) and Third (TAR) Assessment Reports**

| Gas | SAR | TAR |
|---|---|---|
| Carbon Dioxide | 1 | 1 |
| Methane | 21 | 23 |
| Nitrous Oxide | 310 | 296 |
| HFC-23 | 11,700 | 12,000 |
| HFC-125 | 2,800 | 3,400 |
| HFC-134a | 1,300 | 1,300 |
| HFC-143a | 3,800 | 4,300 |
| HFC-152a | 140 | 120 |
| HFC-227ea | 2,900 | 3,500 |
| HFC-236fa | 6,300 | 9,400 |
| Perfluoromethane (CF4) | 6,500 | 5,700 |
| Perfluoroethane (C2F6) | 9,200 | 11,900 |
| Sulfur Hexafluoride (SF6) | 23,900 | 22,200 |

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# Appendix B-Forecasting

***General Forecast Methodology***

ICLEI uses forecast data from various sources (see below) to calculate compounded annual growth rates from each emissions sector. Compounded annual growth rates (from the year 2005 to the year 2020) are calculated from the following formula.

Compounded annual growth rate = ((2020 statistic/2005 population)^(1/15))-1

Once a compounded annual growth rate has been calculated for the sector, this growth rate is applied to emissions for that sector to calculate emissions for 2020 by the following formula.

2020 emissions = (compounded annual growth rate+1)^15*2005 emissions

***Residential Forecast Methodology***

For the residential sector, ICLEI calculates the compounded annual household growth rate between 2005 and 2020, using household projections from ABAG's *Projections 2005*.

***Commercial / Industrial Forecast Methodology***

Analysis contained within "California Energy Demand 2008-2018: Staff Revised Forecast[5]," a report by the California Energy Commission (CEC), shows that commercial floor space and the number of jobs have closely tracked the growth in energy use in the commercial sector. ICLEI uses job growth projections from ABAG's *Projections 2005* to calculate a compounded annual growth rate.

***Transportation Forecast Methodology***

On-Road Vehicle Miles Traveled

The recently passed federal Corporate Average Fuel Economy standards and the state of California's pending tailpipe emission standards could significantly reduce the demand for transportation fuel in the State. An analysis of potential fuel savings from these measures at a scale that would be useful for the purpose of a forecast has not been conducted, nor would such an analysis produce a true business-as-usual estimation. Regardless of future changes in the composition of vehicles on the road as a result of state or federal rulemaking, emissions from the transportation sector will continue to be largely determined by growth in vehicle-miles-traveled (VMT). For this reason, ICLEI uses VMT to predict emission from on-road vehicles.

In their report, "Transportation Energy Forecasts for the 2007 Integrated Energy Policy Report," the CEC projects that on-road VMT will increase at an annual rate of 1.509% per year through 2020[6]. This is the compounded annual growth rate that ICLEI uses to estimate emission growth in the transportation sector for the Pleasanton forecast.

[5] http://www.energy.ca.gov/2007publications/CEC-200-2007-015/CEC-200-2007-015-SF2.PDF

[6] Report available at: http://www.energy.ca.gov/2007publications/CEC-600-2007-009/CEC-600-2007-009-SF.PDF. Compounded Annual growth rate for 2005-2020 is calculated from Table 4 on page 12. In light of recent fuel cost increases, the calculation assumes high fuel cost scenario.

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Off-Road Non Point Emissions

*Lawn and Garden Equipment*

Because the number of pieces of lawn and gardening equipment is dependent upon the number of households, ICLEI uses household projections from ABAG's *Projections 2005* to calculate the annual average growth rate of emissions from lawn and garden equipment.

*Industrial Equipment, Construction Equipment, and Light Commercial Equipment*

The primary determinate for growth in emissions from these off road point sources is the growth of commercial and industrial activity, which can be proxied by using job growth projections from ABAG's *Projections 2005*.

***Waste Forecast Methodology***

The primary determinate for growth in emissions in the waste sector is population. Therefore, the compounded annual population growth rate for 2005 to 2020 as calculated from ABAG population projections in *Projections 2005*, is used to estimate future emissions in the waste sector.

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# Appendix D: Carbon Model

## *Carbon Model*

Dave Erickson, Climate Protection Campaign, September 2009

The Carbon Model is a mathematical representation of all of the significant sources of direct and indirect carbon dioxide emissions in Napa County, and the quantity of emissions from each source. This model also incorporates a representation of "opportunities for intervention" (OFI). The OFI are a means for quantifying emissions reduction from a particular measure or set of measures. The OFI are sector specific and refer to a range of reduction measures, both on the energy supply side, and on the energy demand side.

The Carbon Model gives us a mathematical way for quantifying the effect of emissions reduction measures in various sectors. It allows us to answer questions regarding "how much will be achieved" by a possible measure. It also allows us to answer questions of scale, i.e., "what is the necessary scope of the measures" to reach the overall target. If a cost can be associated with a particular measure, we can evaluate the cost effectiveness, i.e., the amount of carbon reduction per dollar invested.

The model is organized in a fashion similar to a standard emissions inventory. In fact, it is built using inventory source data.[58] The model includes baseline data for electricity use, natural gas use and transportation in Napa County for the years 1990 and 2005. The model also contains projections for "business as usual" levels in each sector for the year 2020.[59] The model was developed using statistics from the California Energy Commission studies on end use of electricity and natural gas in the residential and commercial sectors. The transportation statistics come from Metropolitan Transportation Commission studies of Bay Area travel forecasts. As much as possible, statistics that are local to Napa County were used. In some cases, statewide or national averages were used.

Electricity and natural gas sectors are divided into residential and commercial subsectors. Industrial and agricultural sectors are not included in carbon reduction evaluation. This is due to the fact that there is no general energy end use data for these sectors. The data that is available tends to be specialized and difficult to use to make estimates of reduction measures. The simplification of end use to include only residential and commercial subsectors was considered to be usable because these subsectors account for the majority of energy use in Napa County.

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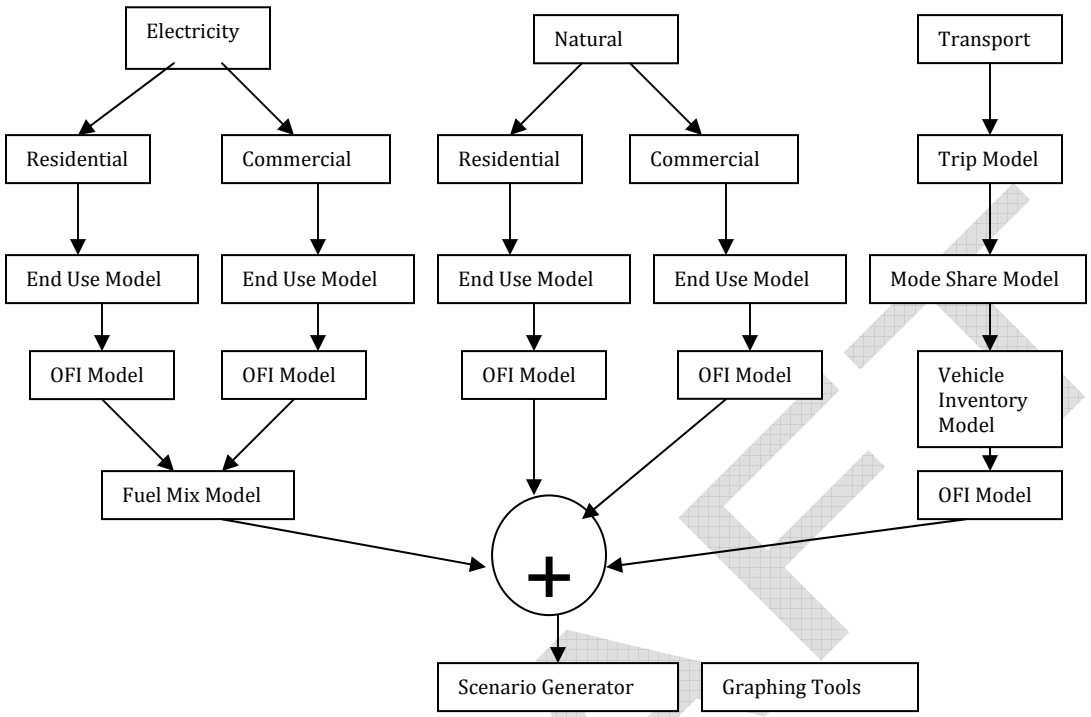
[58] Data were obtained from the California Energy Commission, and the Metropolitan Transportation Commission. Population data were obtained from the California Department of Finance, and from the County of Napa.

[59] Projection and estimation methodology is described in "PG&E LTPP Analysis" developed as part of the Sonoma County Community Climate Action Plan and available online (www.coolplan.org).

## Structure of the Model

**Figure 1**




The electricity and natural gas elements of the model are identical in their structure. The model uses historical data from the California Energy Commission. These data are organized into total megawatt-hours and therms for Residential, Commercial, Industrial and Agriculture and Water Pumping.

The transportation element of the model uses data from the Metropolitan Transportation Commission 2005 Travel Forecast. These data are organized into:

- Total passenger trips
- Average trip length for each trip type
- Share of total trips for each trip type
- Mode share distribution for each trip type

In addition, the transportation element uses vehicle inventory distribution data. The vehicle inventory is estimated using an "On Road Stock Turnover" model, supplied in this case from the Oak Ridge National Laboratory. The total fuel use is estimated using average vehicle fuel efficiency for each of the vehicle types in the On Road Stock Turnover model.

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## Electricity and Natural Gas Elements

The total consumption figures for Residential and Commercial electricity and natural gas subsectors are input to the End Use model. This model is derived from data from various CEC-sponsored end use studies. This model uses a climate-zone specific percentage breakdown of energy end use in the residential and commercial sectors.[60,61,62]

The output of the End Use model is a set of consumption numbers (kWh and therms) that correspond to each end use in the residential and commercial electricity and natural gas sectors.

The OFI model for each sector takes as input an efficiency improvement figure for each end use, and a "penetration" or "uptake" figure. This represents the percentage of the total number of end use application types that would be upgraded. For example, a 50 percent uptake rate on a high efficiency refrigerator means that 50 percent of the households in the service territory have installed one.

As an example, Table 1 shows the OFI table for the residential electricity sector. It shows the results of a theoretical efficiency upgrade program that upgrades the electric water heaters to solar water heaters and upgrades clothes dryers, freezers and dishwashers to super-high-efficiency models. The existing units in 80 percent of the residences are replaced with units that use 80 percent less energy. The solar hot water heater uses 95 percent less energy than an electric model (hypothetical). This will reduce the annual projected residential electric energy use in Napa County from 367 GWh to 314 GWh, an approximate 15 percent reduction in total residential electricity use.

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[60] California Statewide Residential Appliance Saturation Survey, Kema-Xenergy/Itron, 2004-2006.
[61] California Commercial End Use Study, Itron, 2006.
[62] California Statewide Commercial Sector Natural Gas Energy Efficiency Potential Study, Kema-Xenergy, 2003.

**Table 1**

| End Use | percentage of total use | Cumulative percentage | 2005 GWh | Penetration | % improvement | 2005 after retrofit |
|---|---|---|---|---|---|---|
| ***Refrigerator*** | **13.7** | **13.7** | **50.4** | **0%** | **0%** | **50** |
| ***A/C (central & room)*** | **16** | **29.7** | **58.8** | **0%** | **0%** | **59** |
| ***Space Heat*** | **10.1** | **39.8** | **37.1** | **0%** | **0%** | **37** |
| ***Water Heat*** | **9.1** | **48.9** | **33.4** | **80%** | **95%** | **8** |
| ***Lighting*** | **8.8** | **57.7** | **32.3** | **0%** | **0%** | **32** |
| *Residual* | 7.3 | 65 | 26.8 | **0%** | **0%** | **27** |
| ***Clothes dryer*** | **5.8** | **70.8** | **21.3** | **80%** | **80%** | **8** |
| ***Freezer*** | **3.5** | **74.3** | **12.9** | **80%** | **80%** | **5** |
| *Furnace Fan* | 3.3 | 77.6 | 12.1 | **0%** | **0%** | **12** |
| *Television* | 2.9 | 80.5 | 10.7 | **0%** | **0%** | **11** |
| *Electric Range Top* | 2.8 | 83.3 | 10.3 | **0%** | **0%** | **10** |
| ***Dishwasher*** | **2.5** | **85.8** | **9.2** | **80%** | **80%** | **3** |
| *Electric Oven* | 1.8 | 87.6 | 6.6 | **0%** | **0%** | **7** |
| *Microwave Oven* | 1.7 | 89.3 | 6.2 | **0%** | **0%** | **6** |
| *Personal Computer (Desk Top)* | 1.5 | 90.8 | 5.5 | 0% | **0%** | **6** |
| *Other* | 9.2 | 100 | 33.8 | 0% | **0%** | **34** |
| Total | 100 | | 367.6 | | | **314** |

Natural gas OFI is treated in the same way. Shown below is the OFI table for residential natural gas use. This particular OFI models the effect of the installation of solar hot water heaters on 80 percent of the residences in the county. 2005 use and the result are given in therms.

**Table 2**

| Residential Natural Gas End Use | Percent of total | Cumulative | 2005 | Penetration | % improvement | Result |
|---|---|---|---|---|---|---|
| Space Heating | 44% | 44% | 9,395,724 | 0% | 0% | 9,395,724 |
| Water Heat | 44% | 88% | 9,395,724 | 80% | 95% | 2,254,974 |
| Cooking | 7% | 95% | 1,494,774 | 0% | 0 | 1,494,774 |
| Dryer | 3% | 98% | 640,618 | 0% | 0% | 640,618 |
| Pools, Spas, misc | 2% | 100% | 427,078 | 0% | 0% | 427,078 |
| *Total* | *100%* | | 21,353,919 | | | 14,213,168 |

The program modeled in Table 2 results in a decrease of approximately 7 million therms from business as usual residential natural gas consumption, a 33 percent reduction.

## Electricity GHG Evaluation

The output of the OFI model for electricity is used as input to the Fuel Mix Model. This model represents the mix of generation resources used to supply the grid electricity used in the county. Table 3 shows an example of a fuel mix. The format for the first two columns is the same as the familiar "Power Content Label" required by the CPUC for electricity retailers. The third column entries are the average emissions intensity for that generation type. There are various sources for these numbers, but the one used for this model is eGRID from the EIA.[63] The fourth column calculates the total emission factor for that particular "portfolio" or mix of resources.

[63] From the EPA website: "The Emissions & Generation Resource Integrated Database (eGRID) is a comprehensive inventory of environmental attributes of electric power systems. The preeminent source of air emissions data for the electric power sector, eGRID is based on available plant-specific data for all US electricity generating plants that provide power to the electric grid and report data to the US government. eGRID contains air emissions data for nitrogen oxides, sulfur dioxide, carbon dioxide, and mercury."

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The purpose of the fuel mix model is to enable the evaluation of different portfolios of electricity generation resources in terms of their effect on the GHG emissions due to electricity use. The model shown in Table 3 shows the emissions factor from a portfolio consisting of 43 percent natural gas fired generators and 4 percent coal fired generators. The gray area on the model indicates non-emitting resources.[64] The combined emission factor from this resource mix is 0.56 lb eCO2/kWh. This result is then used, along with the electricity OFI model output, to calculate the combined effects of efficiency and varying levels of renewables on the total emissions due to electricity use.

**Table 3**

| Energy Resources | Power Mix | Resource lb/kWh | Combined Emission Factor |
|---|---|---|---|
| *Eligible Renewable* | 67% | | |
| *Biomass and waste* | 14% | | |
| *Geothermal* | 32% | | |
| *Small hydroelectric* | 3% | | |
| *Solar* | 7% | | |
| *Wind* | 11% | | |
| *Nuclear* | 0% | | |
| *Large Hydroelectric* | 14% | | |
| *Natural Gas* | 19% | 1.05 | 0.20 |
| *Coal* | 0% | 2.73 | 0.00 |
| *Other* | | | |
| TOTAL | 100% | | 0.20 |

### Natural Gas GHG Evaluation

The output of the OFI tables for residential and commercial natural gas use are evaluated directly for their GHG emissions levels.

For natural gas, there is a fixed emission factor of 12.3 lbs eCO2/therm. This figure is an average of the suggested EPA factor for natural gas combustion (11.7 lb CO2/therm) and the suggested IPCC factor (13.0 lb CO2/therm).

## Transportation Element

The Transportation Element has four components:

1. Total trips, trip type, average trip length and trip modal distribution table
2. Vehicle inventory and fuel efficiency table
3. Total fuel use and GHG calculation
4. OFI table

[64] Although there are emissions from geothermal, large hydroelectric (methane emissions), and nuclear (from energy used for fuel mining, milling and refining) the State of California considers these generation types to be non-emitting.

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The first element is used to compute total Vehicle Miles Traveled (VMT). The data used in this element come from the Metropolitan Transit Commission Travel Forecast Survey 2005. The best way to visualize the organization of this table is as a two dimensional matrix. The rows of the matrix represent the trip generation model. The columns represent mode choices.

The trip generation model used in this Travel Forecast is composed of the following types:

1. Home-based work
2. Home-based shop
3. Home-based Social/Recreation
4. Non-home-based
5. Home-based grade school
6. Home-based high school
7. Home-based college

Each of these trips types is assigned a share of the total number of trips. There is an average trip distance associated with each of these trip types.

The mode choices for each trip type are as follows:

1. Drive alone
2. Drive 2
3. Drive 3+
4. Transit
5. Walk
6. Bicycle

For the purposes of our transportation OFI, we have simplified modes 1-3 to

1. Car driver
2. Car passenger

The output of this table is total VMT. The input to this table is "daily person trips." This is the total number of trips made each day in Napa County for all purposes, in all modes. This number is converted into passenger miles, which is then converted to vehicle miles using a "loading factor." The loading factor is the number of passenger miles achieved for each mile of vehicle movement. For Napa County transit, the loading factor used was four. That is, an average of four passengers per transit vehicle was assumed for this model.

The calculated annual VMT based on daily person trips for year 2005 is then calibrated to match VMT obtained from the MTC for year 2005. This step is necessary to insure that the input to the vehicle inventory is accurate.

The total calculated VMT is input to a vehicle inventory, which is based on the On Road Vehicle Turnover model mentioned above. This is a national average of the vehicle types and the average fuel efficiency for each vehicle type on the road. The output of this table is the total number of gallons of gasoline and diesel fuel used for the year. These fuel amounts are then converted to

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(metric) tonnes of GHG, using the factors 21.1 lbs eCO2/gallon for gasoline and 22.1 lbs eCO2/gallon for diesel.

The OFI table (shown below in Table 4) has six categories of opportunities to reduce emissions:

1. Transit share increase
2. Non-motorized share increase
3. Non-emitting vehicle
4. Trip (number) reduction
5. Carpool/Vanpool increase
6. Trip length reduction

**Table 4**

| Measures | Transit Share Increase | Non Motorized Share Increase | Non-emitting vehicle | Trip reduction | Carpool/Vanpool Increase | Average Trip Length Reduction |
|---|---|---|---|---|---|---|
| | Free transit pass | Full Path System | Biofuel | Gas tax | Employee Commute Program | Walkable Facility |
| | Increase bus service | Walkable Facility | Plugin Hybrid | Congestion Price | Rural Service Network | Land Use |
| | Other public transportation | Land Use | Other | Land Use | Car Share | Other Reg |
| | Rural Service Network | | | Delivery Service | Ride Auction | |
| | Tax Policy | | | Online shopping | Tax Policy | |
| | | | | Other Tax Policy | | |
| | | | | Telecommute | | |
| Totals | 5% | 9% | 15% | 5% | 4% | 3% |

Opportunities 1, 2 and 5 use the desired percentage shift (entry in the table) to reduce the Car Driver mode share assignment and increase walking and biking, Drive 2/3+ or transit mode share. The non-motorized share increase decreases vehicular modes according to the loading factor. The non-emitting vehicle decreases the share of each standard vehicle type in the vehicle inventory. Trip reduction reduces total daily trips by the entered percentage and trip length reduction reduces average trip length of all trip types by the entered percentage.

Likely and realizable mode share shifts for transit, walking and biking, as well and trip number and length reduction were obtained from the Napa County Transportation Planning Authority.

Non-emitting vehicle increase amount was used to model the effect of a plug-in hybrid or electric car share fleet.

## OVERALL IMPACT SUMMATION AND SCENARIOS

The final step in producing the output of the carbon model is to convert the energy use numbers to GHG emissions and compare those to the target levels.

Table 5 and Table 6 below show the target reference numbers for electricity and natural gas. The total Napa County use in each subsector in 1990 is shown with its corresponding GHG emission

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level. The GHG emission level for electricity for PG&E for 1990[65] is calculated using the carbon intensity factor of 0.566 lb eCO2/kWh. Below the 1990 level is the target level for each subsector. The emission level for natural gas in each sector is calculated using the emission factor mentioned above.

**Table 5**

| Year | Residential | Commercial | Industrial | Agriculture & Water Pumping | Total | GHG (tonnes) |
|---|---|---|---|---|---|---|
| Electricity | | | | | | |
| *1990 (million kWh)* | *291* | *234* | *96* | *13* | *634* | |
| tonnes ghg (1990 PGE mix) | 74,613 | 60,172 | 24,546 | 3,362 | | 162,694 |
| Target GHG Electricity | 74,613 | 60,172 | 24,546 | 3,362 | - | 162,694 |

**Table 6**

| Natural Gas | | | | | | |
|---|---|---|---|---|---|---|
| **1990 (million therms)** | **23.1** | **13.3** | **3.8** | **0.2** | **40.4** | 214,265 |
| **Target GHG Natural Gas (tonnes)** | **122,608** | **70,761** | **20,071** | **825** | **214,265** | **214,265** |

Table 7 below shows typical results from the electricity model. The blue rows show the projected consumption for 2020 in each subsector, along with the projected total emissions level based on the PG&E Long Term Procurement Plan.[66] This is also known as "the business as usual level." The next rows in orange show three scenarios:

1. The resulting GHG emissions if just the emission factor from the Fuel Mix Model is used (CCAP Fuel Mix GHG).
2. The GHG emissions if only the effects of the Residential and Commercial efficiency models are considered, using the business as usual electricity emission factor (CCAP Efficiency GHG).
3. The combined effect of both the fuel mix and the efficiency models. Residential and Commercial subsector efficiency improvements only are considered in the scenarios. The Industrial and Agriculture & Water Pumping subsectors are modified by the fuel mix model (Fuel Mix GHG and Combined).

**Table 7**

| Year | Residential | Commercial | Industrial | Agriculture & Water Pumping | Total | GHG (tons) | % below 1990 |
|---|---|---|---|---|---|---|---|
| ***2015 (million kWh)*** | ***1,406*** | ***1,289*** | ***405*** | ***129*** | ***3,230*** | | |
| ***Electricity BAU (tons)*** | ***254,530*** | ***233,338*** | ***73,344*** | ***23,418*** | | ***584,630*** | ***5%*** |
| *CCAP Fuel Mix GHG* | 140,273 | 128,594 | 40,420 | 12,906 | 322,193 | 322,193 | 48% |
| *CCAP Efficiency GHG* | 217,704 | 193,374 | 73,344 | 23,418 | 507,840 | 507,840 | 18% |
| *Combined Efficiency & Fuel Mix* | 121,816 | 106,569 | 40,420 | 12,906 | 281,711 | 281,711 | 54% |

The last two columns of the model show total GHG emissions and percentage reduction below 1990 levels. From this example output it can be seen that the modeled efficiency programs alone result in

[65] The California Climate Action Registry: Development of Methodologies for Calculating Greenhouse Gas Emissions from Electricity Generation. Environmental Energy Technologies Division, Ernest Orlando Lawrence Berkeley National Laboratory, August 2002.

[66] Pacific Gas and Electric Company 2006 Long Term Procurement Plan, filed with the California Public Utilities Commission, March 2007.

an 18 percent reduction below 1990 levels. The fuel mix alone results in a 47 percent reduction, while the combined effect of the modeled fuel mix and efficiency results in a reduction of 54 percent below 1990 levels. For comparison, the business as usual reference results in a 5 percent reduction below 1990 levels.

Table 8 below shows example output from the natural gas model. As in the electricity model, the rows in blue show the business as usual projection for natural gas use in 2015. The rows in orange show the results of two scenarios:

1. The effects of residential an commercial natural gas efficiency programs;
2. The results of a natural gas replacement program in which natural gas space heating is replaced with heat pumps and natural gas water heaters are replaced with solar water heaters.

**Table 8**

| Year | Residential | Commercial | Industrial | Agriculture & Water Pumping | Total | GHG (tons) |
|---|---|---|---|---|---|---|
| *2015 projected (million therms)* | *81.8* | *39.1* | *7.0* | *1.1* | *129.0* | |
| **Natural Gas BAU (tons)** | **478,561** | **228,599** | **40,775** | **6,716** | | ***793,350*** |
| *CCAP Efficiency Rollout* | 312,105 | 208,291 | 40,775 | 6,716 | | 567,886 |
| *CCAP Geothermal Rollout* | 334,865 | 107,664 | 40,775 | 6,716 | | 490,019 |

Table 9 shows the output from the transportation model. The Transportation Scenario line shows the aggregated reduction of all measures in the Transportation OFI table. A negative "percentage below" means "percentage above." In the table below, the 2015 projected level is 19.2 percent above 1990.

**Table 9**

| Transportation | Annual VMT | tons eCO2 | % below 1990 |
|---|---|---|---|
| 1990 Level | **3,007,965,000** | **2,340,667** | **0.0%** |
| **Target Level (25% below 1990)** | | **1,755,500** | **25.0%** |
| **2015 Projected Level** | **4,440,902,008** | **2,788,992** | -19.2% |
| *CCAP Transportation Scenario* | | 2,049,542 | 12.4% |

Table 10 below shows the total model output summation. There are four scenarios that have been defined showing the aggregate effects of actions in each sector. The first two columns show the "Business as Usual" scenario. This is the scenario in which there is no action taken in any sector at the local level. The projected emissions for each scenario are shown in the first column and the percentage below 1990 levels in the next column for each sector.

The scenarios are as follows:

1. Residential and Commercial electricity end-use efficiency programs only
2. Residential and Commercial electricity end-use efficiency and renewable grid fuel mix
3. Residential and commercial electricity efficiency, renewables and natural gas replacement

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4. All of the above plus required transportation OFI

**Table 10**

| Sector | BAU | below 1990 | Scenario 1 | below 1990 | Scenario 2 | below 1990 | Scenario 3 | below 1990 | Scenario 4 | below 1990 |
|---|---|---|---|---|---|---|---|---|---|---|
| Electricity | 584,630 | 5.5% | 474,031 | 23.4% | 263,476 | 57.4% | 263,476 | 57.4% | 263,476 | 57.4% |
| Natural Gas | 793,350 | -18.5% | 793,350 | -18.5% | 793,350 | -18.5% | 490,019 | 26.8% | 490,019 | 26.8% |
| Transportation | 2,788,992 | -19% | 2,788,992 | -19% | 2,788,992 | -19% | 2,788,992 | -19% | 2,049,542 | 12% |
| Total | 4,166,972 | -15% | 4,056,373 | -12% | 3,845,818 | -6% | 3,542,487 | 2% | 2,803,037 | 23% |
| 1990 Total | 3,628,880 | | | | | | | | | |
| Target Total | 2,721,660 | | | | | | | | | |

## Example Outputs

The model is implemented as an Excel spreadsheet. As such, the output of the model can be represented in either tabular or graphic form, using the capabilities of Excel. The model enables us to project the effects of efficiency programs and different renewable generation portfolios on emissions in the electricity and natural gas sectors. For the transportation sector, we can project the effects of programs designed to shift mode share, reduce the number of trips, or reduce average trip length. We can also project the effects of using "non-emitting" vehicles such as EVs.

Figure 2 shows the effect on emissions in the residential electricity sector from the rollout of six different levels of energy efficiency improvement programs. Each curve in the figure corresponds to a particular uptake rate, from 70% adoption to 95% adoption. The X axis is the overall percentage improvement in efficiency, from 20% to 80%. For example, the top blue line shows the change in GHG emissions if a program is implemented where the adoption rate is 95%, and the level of efficiency improvement is varied between 20% and 80%. This graph assumes a package of end use electricity upgrades that include the top eight residential electricity using appliances:

1. Refrigerator
2. Air conditioner
3. Space heater
4. Water heater
5. Lighting
6. Clothes dryer
7. Freezer
8. Dishwasher

Note: The fuel mix used for these results was assumed to be the same as the 2006 PG&E mix.

This chart shows that emissions from electricity use in the residential sector will be reduced by 25 percent below 1990 levels (target level) if 95 percent of the residences in Napa County install a package of upgrades to the listed end uses that has an overall 65 percent efficiency improvement. At the other end of the range, a minimum of 75 percent of the residences would have to adopt a package of upgrades that has an overall 80 percent improvement in efficiency in order to achieve the target level.

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**Figure 2**

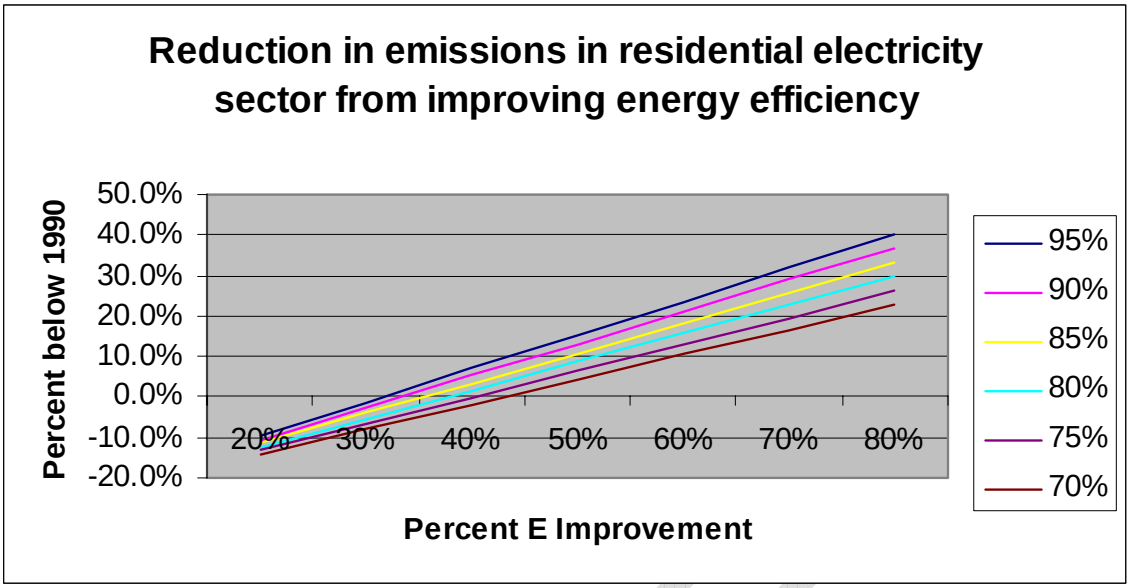


Figure 3 below shows the reduction in total carbon emissions in the electricity sector as the percentage of eligible renewables is increased. The starting point on the curve is the emissions from the "California Mix" which is the fuel mix of the wholesale power market. 25 percent reduction below 1990 levels in the electricity sector occurs at 54% renewables. The red curve shows the effect on overall (total) emissions from increasing renewables only, and keeping all other emissions sources (in all sectors) constant. This experiment shows how we can vary the effect of a single emissions reduction measure and track the effect on total emissions, as well as the effect within a single sector.

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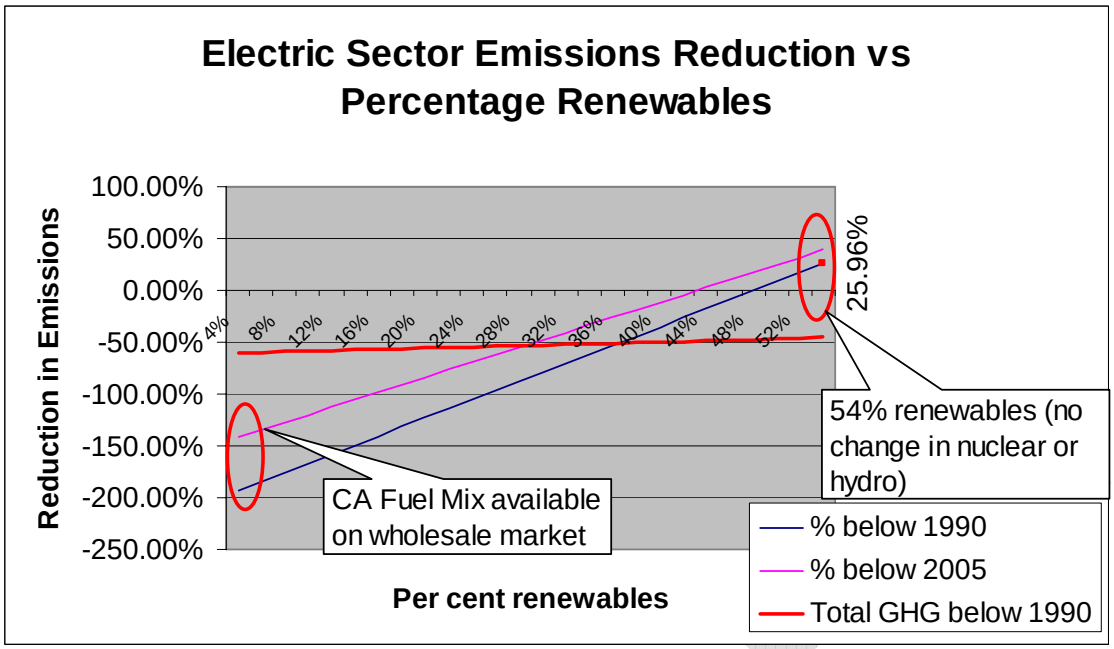
**Figure 3**




Finally, we can plot the effect on emissions of multiple reduction programs at varying levels of effectiveness. The curves for reductions in total emissions relative to 1990 due to efficiency improvement and increase in the percentage of renewables combined are shown in Figure 4 below.

This experiment shows the level of renewables and efficiency that would have to be implemented in order to reach the Napa County overall emissions target. The curve labeled "low E improve" is from a "low adoption rate" residential electricity efficiency program (70%) with "low" overall efficiency improvement (20%). The curve labeled "hi E improve" is from a very high adoption rate residential electricity efficiency program (95%) with a very high efficiency improvement (80%). A high efficiency improvement was included in the commercial electricity sector. This graph assumes no change in the transportation sector, or in natural gas use. This graph shows how the effects of multiple variables on total emissions can be modeled.

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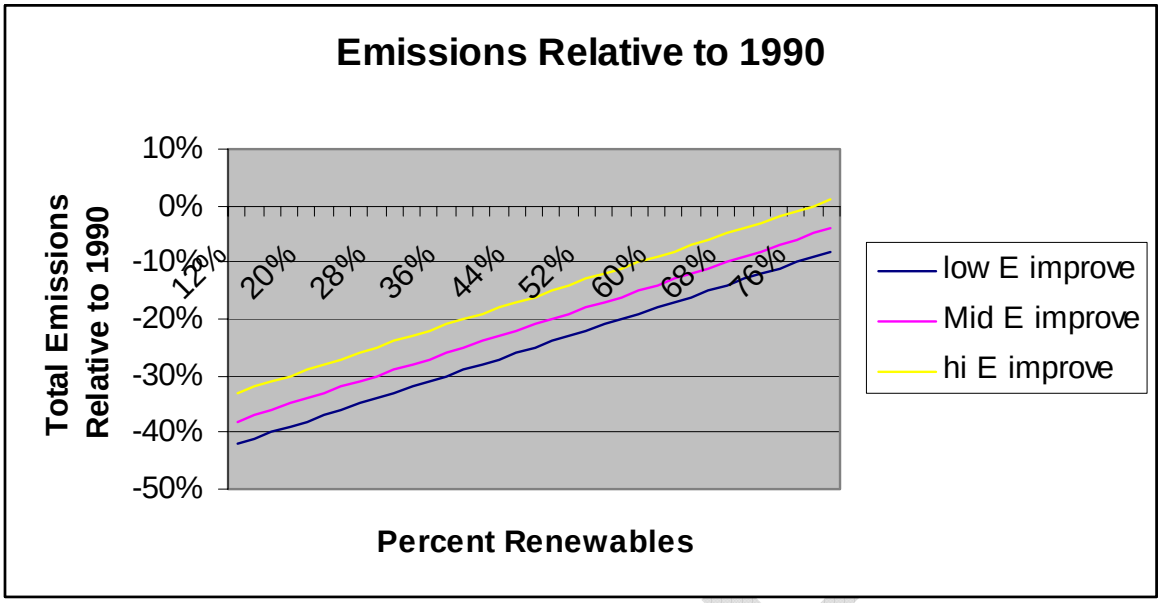
**Figure 4**




## Summary and Conclusion

This report describes the "carbon model" used in the CCAP to estimate the effects of emission reduction measures on the overall emissions of GHG from Napa County. The model can be used to determine the necessary reductions from measures in each subsector. "Opportunities for intervention" represent the categories of actions that can be taken to reduce emissions in each sector. This model can be used to both quantify the effects of specific measures and to estimate the optimum level of reduction from each set of measures required to reach the overall reduction target.

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# Appendix E: Potential Impact of AB 811 Program in Napa County

As part of this analysis, we addressed the question: "What would be the impact on GHG emissions in Napa County of implementing an AB 811 program?"

For this analysis, we made the following assumptions:

- Only owner-occupied residences would be affected
- An average of 40% improvement in end use efficiency would be cost-effective and therefore achieved
- Retrofits are completed by 2020

GHG emission reductions comparing 2005 with 2020 levels are projected to be:

- Electricity - 2.3 % reduction
- Natural gas - 12.6% reduction
- Overall - 3% reduction

The following table shows how the calculations were made.

| End Use | % of total use | 2005 MWh | Penetration | % improvement | 2005 after retrofit | Served | Cost | Total |
|---|---|---|---|---|---|---|---|---|
| ***A/C (central)*** | **16** | **58.8** | **60%** | **40%** | **45** | **29,574** | **$1,000** | **$29,574,000** |
| ***Space Heat*** | **10.1** | **37.1** | **60%** | **40%** | **28** | **29,574** | **$5,000** | **$147,870,000** |
| ***Water Heat*** | **9.1** | **33.4** | **60%** | **40%** | **25** | **29,574** | **$600** | **$17,744,400** |
| ***Lighting*** | **8.8** | **32.3** | **60%** | **10%** | **30** | **29,574** | **$1,000** | **$29,574,000** |
| | | | | | | | $8,100 | **$224,762,400** |

***Building Envelope and Heating/Hot Water Retrofit Program Effectiveness Estimate***

| **Effiency** | | | | | |
|---|---|---|---|---|---|
| End Use | % of total | 2005 Therms | Penetration | % improve | Result |
| | | | | | |
| Space Heating | 44% | 9,395,724 | 60% | 40% | 7,140,751 |
| Water Heat | 44% | 9,395,724 | 60% | 40% | 7,140,751 |

| **Before Totals** | | | **After Elec Retrofit** | | Difference | **After Bldg Envelope/Furnace Retrofit** | | |
|---|---|---|---|---|---|---|---|---|
| *Compared to 2005* | | | *Compared to 2005* | | | *Compared to 2005* | | Difference |
| Electricity | 2.8% | | Electricity | 0.5% | 2.3% | Electricity | 2.8% | 0.0% |
| Natural Gas | 5.4% | | Natural Gas | 5.4% | 0.0% | Natural Gas | -7.2% | 12.6% |
| Transportation | 25.0% | | Transportation | 25.0% | 0.0% | Transportation | 25.0% | 0.0% |
| **Total** | **16.9%** | | **Total** | **16.5%** | **0.5%** | **Total** | **14.6%** | **2.3%** |
| | | | | | 0.0% | | | 0.0% |
| *Compared to 1990* | | | *Compared to 1990* | | 0.0% | *Compared to 1990* | | 0.0% |
| Electricity | 31.5% | | Electricity | 28.5% | 3.0% | Electricity | 31.5% | 0.0% |
| Natural Gas | -6.3% | | Natural Gas | -6.3% | 0.0% | Natural Gas | -17.4% | 11.2% |
| Transportation | 28.4% | | Transportation | 28.4% | 0.0% | Transportation | 28.4% | 0.0% |
| **Total** | **21.5%** | | **Total** | **21.0%** | **0.5%** | **Total** | **19.1%** | **2.4%** |

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## Electricity Retrofit Program Effectiveness Estimate

| End Use | % of total use | MWh 2005 | Penetration | % Improvement | MWh 2005 after retrofit | Served | Cost | Total |
|---|---|---|---|---|---|---|---|---|
| *A/C (central)* | 16.0 | 58.8 | 60% | 40% | 45 | 29,574 | $1,000 | $29,574,000 |
| *Space Heat* | 10.1 | 37.1 | 60% | 40% | 28 | 29,574 | 5,000 | 147,870,000 |
| *Water Heat* | 9.1 | 33.4 | 60% | 40% | 25 | 29,574 | 600 | 17,744,400 |
| *Lighting* | 8.8 | 32.3 | 60% | 10% | 30 | 29,574 | 1,000 | 29,574,000 |
| | | | | | | | $8,100 | $224,762,400 |
| | | | | | | | | |
| Total Households 2005 = 49,290, 66% Owner Occupied | | | | | | | | |
| **Building Envelope and Heating/Hot Water Retrofit Program Effectiveness Estimate Efficiency** | | | | | | | | |
| **End Use** | **% of total** | **2005 Therms** | **Penetration** | **% improvement** | **Result** | | | |
| Space Heating | 44% | 9,395,724 | 60% | 40% | 7,140,751 | | | |
| Water Heat | 44% | 9,395,724 | 60% | 40% | 7,140,751 | | | |
| | | | | | | | | |
| **2020 Emissions Estimates** | | | | | | | | |
| **Before Retrofit Totals** | **% of total use** | | **After Elec Retrofit** | **% Improvement** | **Difference** | **After Bldg Envelope/Furnace Retrofit** | | |
| **Compared to 2005** | | | **Compared to 2005** | | | **Compared to 2005** | | **Difference** |
| Electricity | 2.8% | | Electricity | 0.5% | 2.3% | Electricity | 2.8% | 0.0% |
| Natural Gas | 5.4% | | Natural Gas | 5.4% | 0.0% | Natural Gas | -7.2% | 12.6% |
| Transportation | 25.0% | | Transportation | 25.0% | 0.0% | Transportation | 25.0% | 0.0% |
| Total | 16.9% | | Total | 16.5% | 0.5% | Total | 14.6% | 2.3% |
| | | | | | 0.0% | | | 0.0% |
| | | | | | | | | |
| **Compared to 1990** | | | **Compared to 1990** | | | **Compared to 1990** | | |
| Electricity | 31.5% | | Electricity | 28.5% | 3.0% | Electricity | 31.5% | 0.0% |
| Natural Gas | -6.3% | | Natural Gas | -6.3% | 0.0% | Natural Gas | -17.4% | 11.2% |
| Transportation | 28.4% | | Transportation | 28.4% | 0.0% | Transportation | 28.4% | 0.0% |
| Total | 21.5% | | Total | 21.0% | 0.5% | Total | 19.1% | 2.4% |

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# Appendix F: Glossary of Acronyms and Terms

| | |
|---|---|
| ABAG | Association of Bay Area Governments |
| BAAQMD | Bay Area Air Quality Management District |
| BAU | Business as Usual |
| CACPS | Clean Air Climate Protection Software |
| CARB or ARB | California Air Resources Board |
| CCA | Community Choice Aggregation |
| CCAP | Community Climate Action Plan |
| CCP™ | Cities for Climate Protection |
| CEC | California Energy Commission |
| $CO_2$ | Carbon Dioxide |
| CPUC or PUC | California Public Utility Commission |
| CTP | Comprehensive Transportation Plan |
| $eCO_2$ | Equivalent Carbon Dioxide — usually expressed in tons |
| EIR | Environmental Impact Report |
| EPA or USEPA | United States Environmental Protection Agency |
| ESP | Electric Service Provider |
| GDP | Gross Domestic Product |
| GHG | Greenhouse Gas — usually expressed in tons of $eCO_2$ |
| GMP | Gross Metro Product |
| HVAC | Heating, Ventilation, and Air Conditioning |
| ICLEI | International Council of Local Environmental Initiatives |
| IOU | Investor-Owned Utility |
| IPCC | International Panel on Climate Change |
| JPC | Joint Policy Committee |
| LEED | Leadership in Energy and Environmental Design |
| LFG | Landfill Gas |
| MTC | Metropolitan Transportation Commission |
| NCTPA | Napa County Transportation and Planning Commission |
| PAYS® | Pay As You Save |
| PG&E | Pacific Gas and Electric Company |
| PHEV | Plug-in Hybrid Electric Vehicle |

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| | |
|---|---|
| PPM | Parts Per Million |
| RPS | Renewable Portfolio Standard |
| VMT | Vehicle Miles Traveled |

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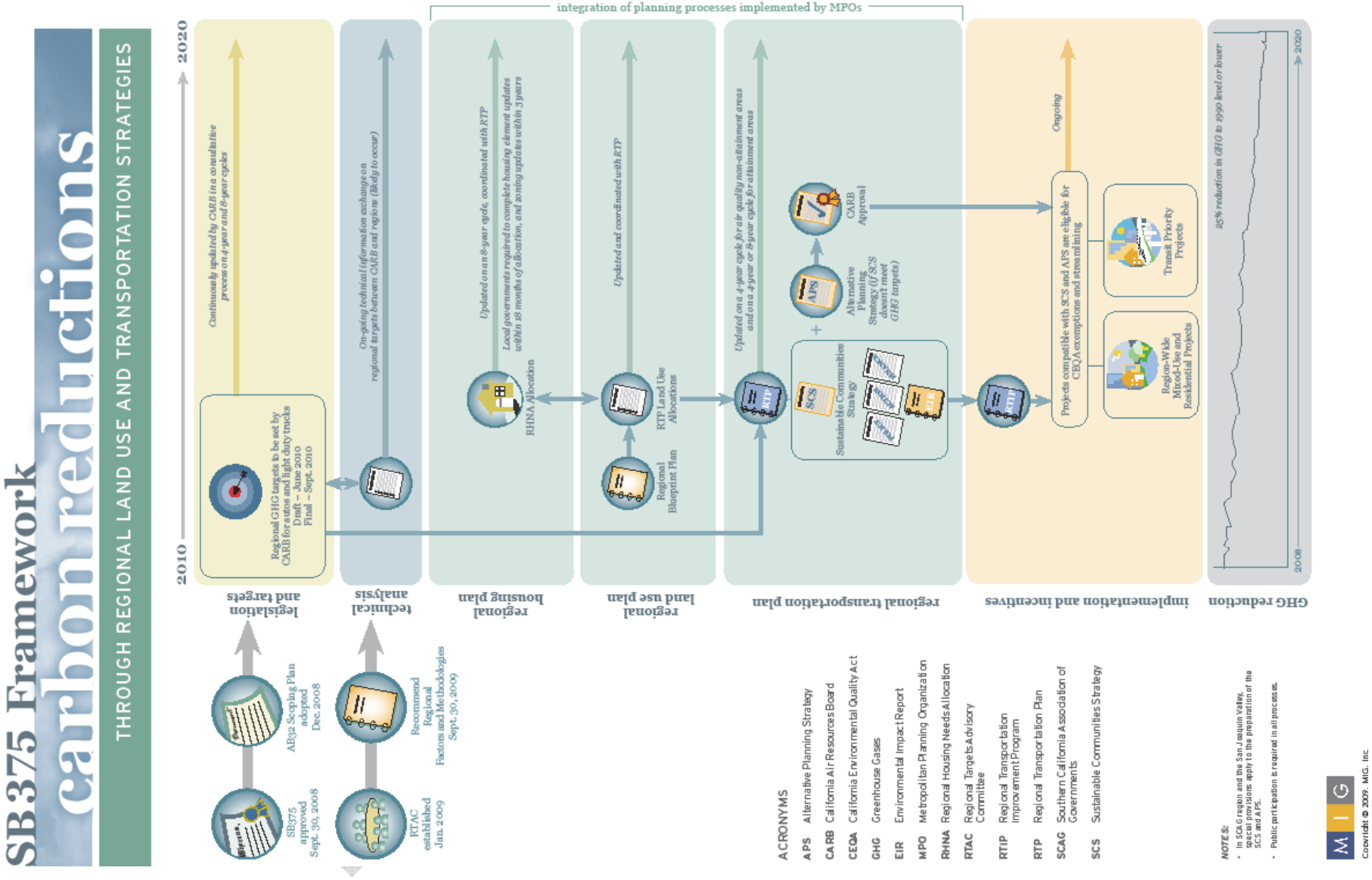
# Appendix H: SB375 Framework: Carbon Reductions Through Regional Land Use and Transportation Strategies



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# Appendix H: Solid Waste GHG Emissions Analysis Summary Report



## GHG Emissions Analysis -- Summary Report

(Version 9.01, 3/09)

Analysis of GHG Emissions from Waste Management

**GHG Emissions from Baseline Waste Management (MTCO2E): -3,247**

| Material | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Total MTCO2E |
|---|---|---|---|---|---|
| Food Scraps | N/A | 18,000 | 0 | 0 | 5,858 |
| Yard Trimmings | N/A | 17,000 | 0 | 0 | -9,104 |

**GHG Emissions from Alternative Waste Management Scenario (MTCO2E): -6,935**

| Material | Tons Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Total MTCO2E |
|---|---|---|---|---|---|---|
| Food Scraps | N/A | N/A | 0 | 0 | 18,000 | -3,566 |
| Yard Trimmings | N/A | N/A | 0 | 0 | 17,000 | -3,368 |

**Total Change in GHG Emissions: -3,688 MTCO2E**

Note: A negative value indicates an emission reduction; a positive value indicates an emission increase.

a) For an explanation of the methodology used to develop emission factors, see EPA report: Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste (EPA530-R-98-013) -- available on the Internet at http://www.epa.gov/climatechange/wycd/waste/reports.html Please note that some of the emission factors used to generate these results do not match those presented in the report due to recent additions and/or revisions.

b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

c) Total emissions estimates provided by this model may not sum due to independent rounding.

Back to WARM | View Emission Factors

# GHG Emissions Analysis -- Summary Report

(Version 9.01, 3/09)

Analysis of GHG Emissions from Waste Management

**GHG Emissions from Baseline Waste Management (MTCO2E): -10,329**

| Material | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Total MTCO2E |
|---|---|---|---|---|---|
| Mixed Recyclables | 0 | 35,000 | 0 | N/A | -10,329 |

**GHG Emissions from Alternative Waste Management Scenario (MTCO2E): -100,895**

| Material | Tons Reduced | Tons Recycled | Tons Landfilled | Tons Combusted | Tons Composted | Total MTCO2E |
|---|---|---|---|---|---|---|
| Mixed Recyclables | N/A | 35,000 | 0 | 0 | N/A | -100,895 |

**Total Change in GHG Emissions: -90,566 MTCO2E**

Note: A negative value indicates an emission reduction; a positive value indicates an emission increase.

a) For an explanation of the methodology used to develop emission factors, see EPA report: Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste (EPA530-R-98-013) -- available on the Internet at http://www.epa.gov/climatechange/wycd/waste/reports.html Please note that some of the emission factors used to generate these results do not match those presented in the report due to recent additions and/or revisions.

b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

c) Total emissions estimates provided by this model may not sum due to independent rounding.

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**<inside back cover>**

# acknowledgements


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J. Dave Erikson
Ken Wells

## The Community
This Countywide Climate Action Framework was developed and will be implemented with attention, time, and resources from many people in Napa County, the individuals, entities and organizations who will lead many of the county and cities' efforts to implement this Framework.


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