YOLO COUNTY
CLIMATE ACTION PLAN:

A Strategy for Smart Growth Implementation, Greenhouse Gas Reduction, and Adaptation to Global Climate Change

Adopted by Yolo County Board of Supervisors Resolution 11-17
March 15, 2011

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In Association with Fehr & Peers Transportation Consultants and CTG

ACKNOWLEDGEMENTS

The County of Yolo would like to thank and acknowledge the efforts of all those involved in the creation of the Climate Action Plan.

Public

The Climate Action Plan has been improved through the assistance of many people; however the County appreciates the particular contributions of the following:

- Dr. Louise Jackson, UC Davis
- Dr. Ryan Hayden, UC Davis
- Dr. Stephen Wheeler, UC Davis

Board of Supervisors

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- Ron Milam, Fehr & Peers Transportation Consultants

Partners

- Mike McKeever, Sacramento Area Council of Governments*
- Greg Chew, Sacramento Area Council of Governments*
- Members of the Yolo County Climate Change Compact

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- Janill Richards, Deputy Attorney General
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- Terry Watt, Consultant, Attorney General's Office
- Matt Jones, Yolo-Solano Air Quality Management District

*FUNDING ASSISTANCE FOR THIS REPORT WAS PROVIDED BY SACOG

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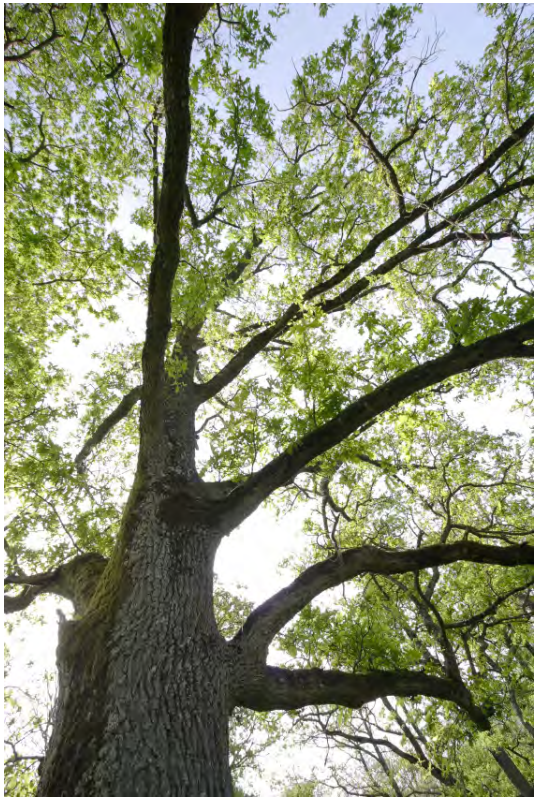
CLIMATE ACTION CONTEXT

Yolo County has a strong commitment to the reduction of greenhouse gas (GHG) emissions, which is balanced with its strong commitment to agriculture and the role of agriculture in reducing GHG emissions. This is the result of the County's long-term advocacy of responsible growth, agricultural and open space preservation and energy conservation. With regard to climate change, this history goes back to 1982, when the County adopted a countywide Energy Plan, one of the first of its kind in the State. More recently, in 2007, the Board of Supervisors unanimously approved a resolution to participate in the Cool Counties Climate Stabilization Declaration and committed to reduce GHG emissions by 80% by 2050.

The 2030 Yolo County General Plan expanded on this established tradition and contains more than 350 climate change-focused policies and actions. General Plan Action CO-A117 calls for the development of a GHG Emissions Reduction Plan and/or Climate Action (CAP) for the County, to reduce GHG emissions, and to address economic and social adaptation to the effects of climate change. The CAP builds on the General Plan's vision and outlines detailed strategies and measures to achieve these goals and contribute to State and international climate protection efforts.

Although agriculture contributes a small proportion of overall GHG emissions, it has an unrecognized yet essential value that greatly outweighs its minor impact on climate change. The inventories show that each acre of agriculture and open space conserved saves nearly 100 times the amount of GHG emissions that would result if the land were converted to urban use. Thus, the protection of farmland and open space limits the spread of urban development, thereby avoiding uses that create significantly higher levels of GHG emissions.

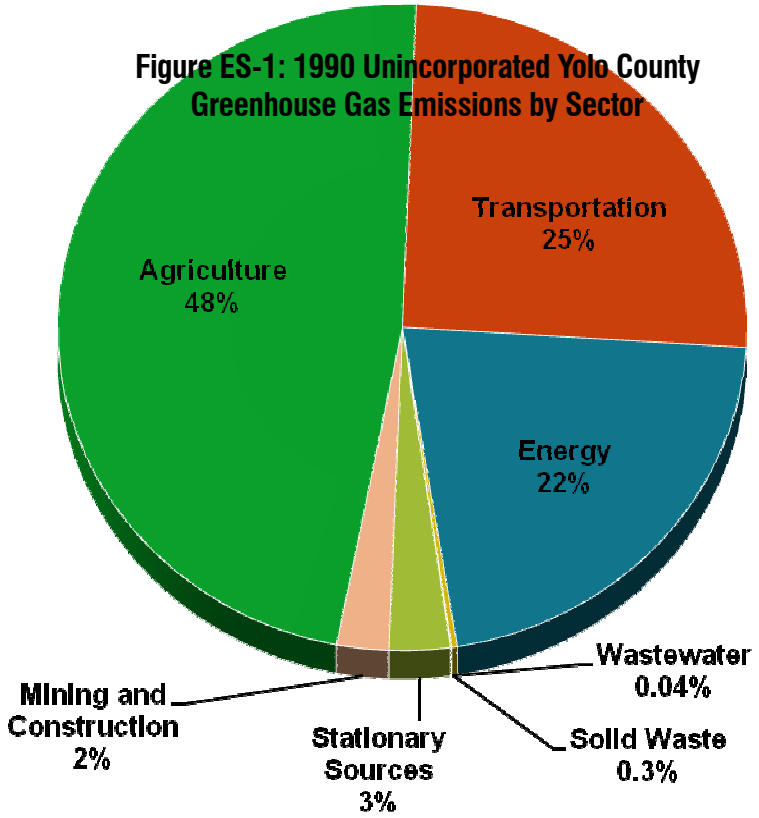
The CAP recognizes the valuable contributions made by farmland and open space in providing a positive alternative to more adverse land use patterns. It includes measures that will create potential funding and incentives to assist farmers in



voluntarily reducing their share of overall emissions. In the future, the CAP may provide new opportunities for farmers that have hedgerows, permanent crops, riparian areas, and new oak woodlands to sell carbon sequestration credits. These efforts will strengthen the agricultural economy, maintaining an economically viable alternative to urban development, and thereby preventing higher GHG levels. By emphasizing its historic agricultural traditions, Yolo County will continue to provide climate change solutions for an increasingly urbanized region.

As a part of this continuing commitment, the CAP is intended to be an evolving document. The study of climate change is a relatively new field; one which is expanding and being refined at a rapid pace. The CAP is not being adopted as a part of the County General Plan, in order to provide the flexibility needed to allow it to be modified to reflect new research, changing technology, and economics. Progress on the CAP will be reviewed by the Board of Supervisors biennially, while the inventories will be updated every five years. Adoption of the CAP establishes an ongoing process by which the County will

Figure ES-1: 1990 Unincorporated Yolo County Greenhouse Gas Emissions by Sector



enhance its approach to reducing climate change and adapt to future challenges.

EMISSIONS INVENTORIES AND PROJECTIONS

The County prepared community GHG emissions inventories for both 1990 and 2008. The 1990 historic inventory allows an understanding of the level of emission reductions required to comply with State requirements. The 2008 inventory provides insight regarding emissions growth over the last two decades and aligns with the General Plan baseline year.

1990 Historic Emissions Inventory

In 1990, the unincorporated portions of Yolo County generated approximately 613,651 metric tons (MT) of carbon dioxide equivalent (CO_2e) emissions. The breakdown of 1990 GHG emissions by sector within the unincorporated area is shown in Figure ES-1. The historic 1990 inventory does not include emissions from the four cities, UC Davis, tribal lands, special districts, and/or federal and State-owned lands. Each of these entities is responsible for adopting their own inventories and climate action plans.

Since the CAP only looks at the unincorporated area, it can give a distorted perspective on the relative contributions of the various sectors, particularly agriculture. Instead, a better picture can be provided by looking at countywide GHG emissions in 1990, as shown in Figure ES-2. Here it can be seen that the entire farming sector was approximately equivalent to the City of West Sacramento in terms of GHG emissions, and was equal to only about half of the GHG emissions of Woodland and two-thirds those of Davis. Thus, while farming is the largest source of emissions within the unincorporated area, it plays a much more modest role within the county as a whole.

A countywide inventory was not prepared for 2008. However, given the growth in the four cities over the past twenty years and the improvements made to farm practices (e.g., reduced nitrogen fertilizer use, more efficient irrigation, conversion to solar power for small pumps), it is likely that agriculture's relative contribution to total emissions has decreased significantly.

2008 Existing Emissions Inventory

In 2008, the unincorporated portions of Yolo County generated approximately 651,740 MT CO_2e. The breakdown of 2008 emissions by sector within the unincorporated area is shown in Figure ES-3. The total emissions inventory increased by only 6% between 1990 and 2008, even as the unincorporated population grew by 9.8%. The two biggest changes during this time period were energy and transportation. The emissions associated with energy went up 38%, as households increased their energy demand by building larger houses and filling them with multiple televisions, computers, cell phone chargers, kitchen appliances, spa tubs, and other consumer goods. By contrast, transportation emissions went down 32%, primarily due to improved fuel efficiency and air quality standards.

Figure ES-2: Greenhouse Gas Emissions by Jurisdiction in 1990

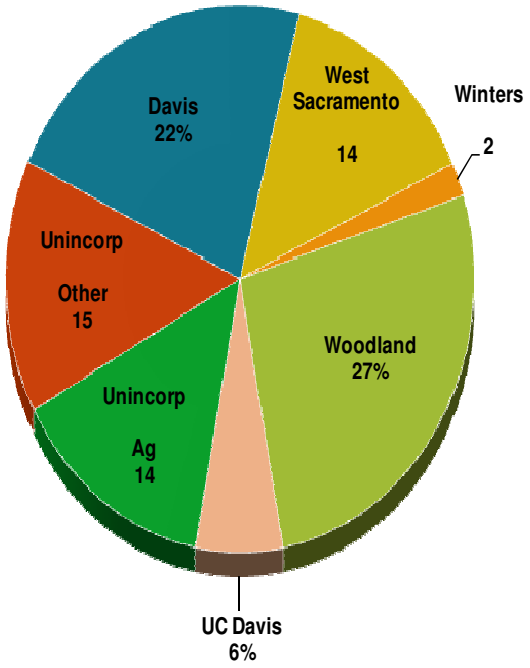
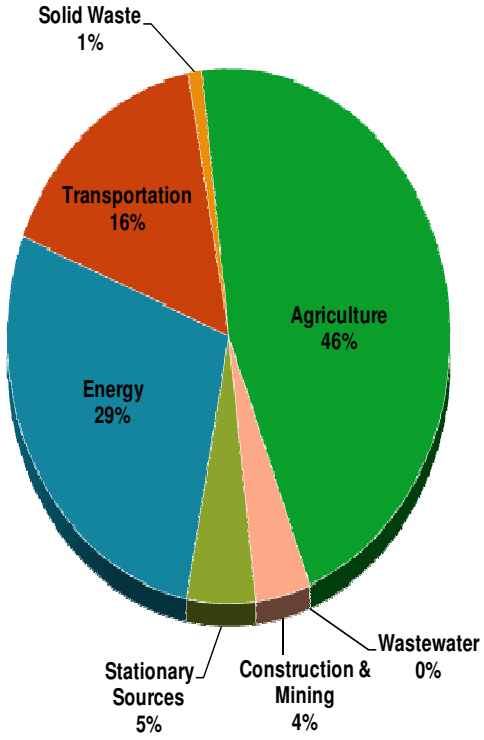


Figure ES-3: Unincorporated Greenhouse Gas Emissions by Sector in 2008

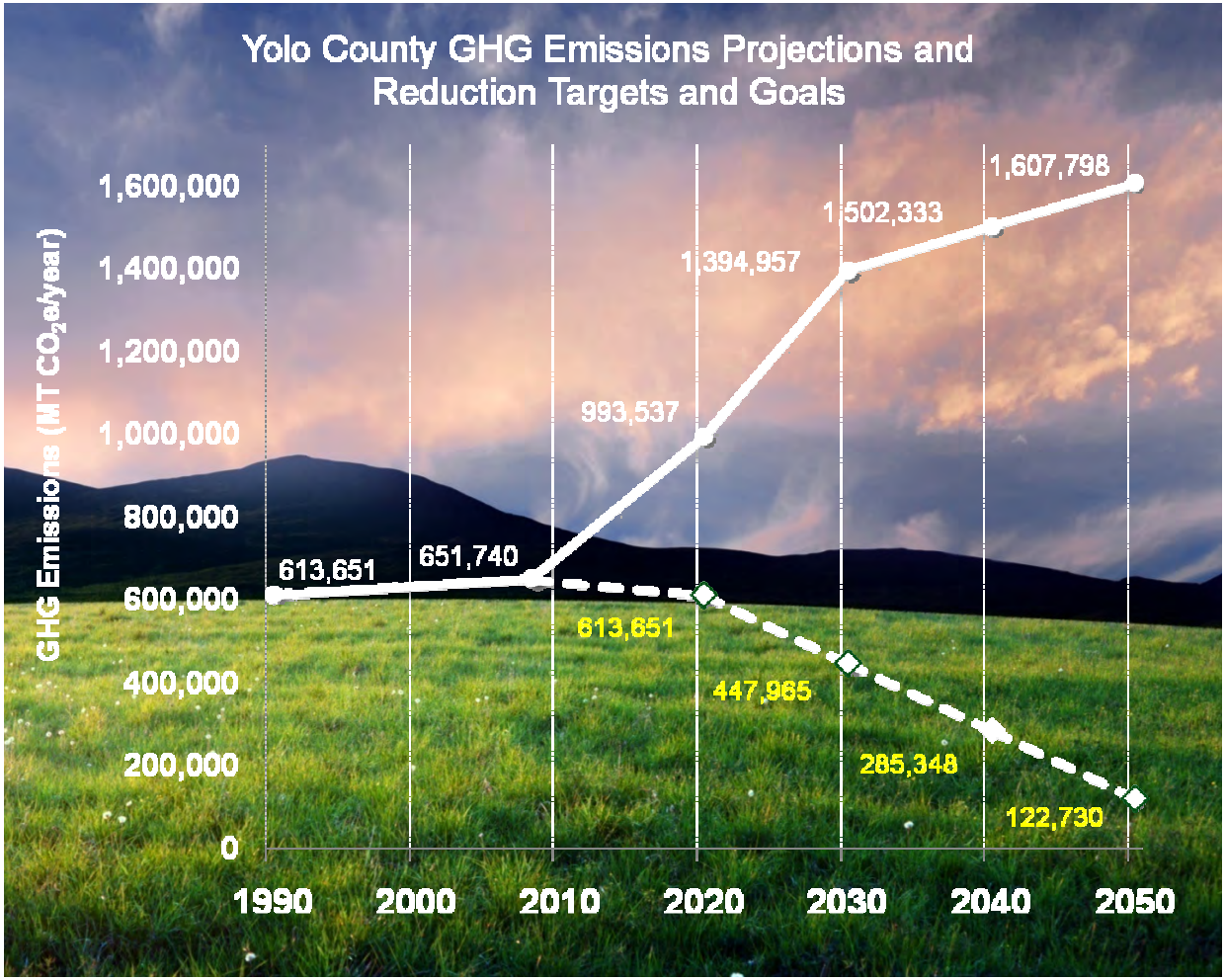



TIMELINE +
TARGETS
1982
Yolo County adopts Energy Plan
Kyoto Protocol
1997
2006
California Global Warming Solutions Act (AB-32) adopted
Yolo County signs Cool Counties Climate Stabilization Declaration
2007
2009
Yolo County General Plan adopted
Yolo County Establishes Energy Watch Partnership
2010
2011
Yolo County Climate Action Plan adopted
Yolo County GHG reduction target: 1990 levels
2020
2030
Yolo County GHG reduction goal: 27% below 1990 levels
Yolo County GHG reduction goal: 80% below 1990 levels
2050

Emission Projections

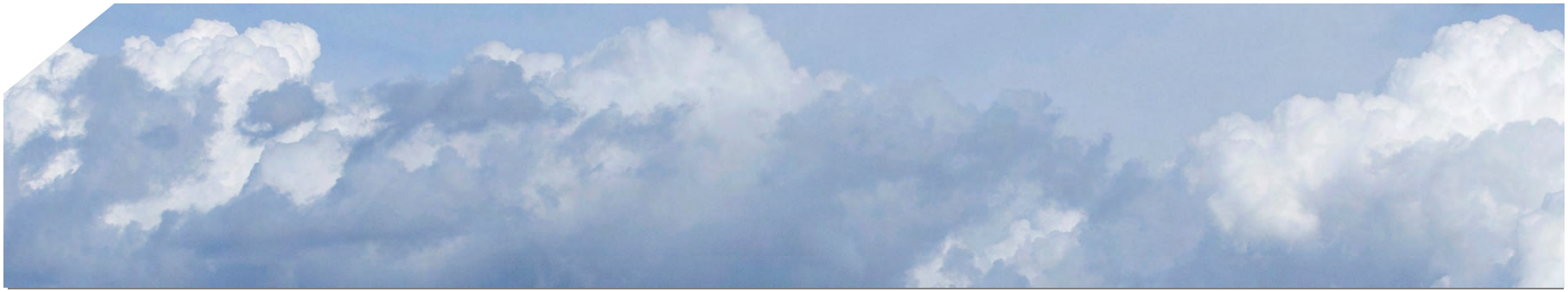
Emission projections estimate future emissions levels and provide insight regarding the scale of reductions necessary to achieve an emissions target. The County prepared projections for 2020, 2030, and 2050 based on population and employment growth forecasts. Projected jurisdictional emissions for unincorporated Yolo County (assuming no implementation of the CAP) would be as follows:

- 2020 – 62% higher than 1990 levels (993,537 MT CO_2e)
- 2030 – 127% higher than 1990 levels (1,394,957 MT CO_2e)
- 2040 – 145% higher than 1990 levels (1,502,333 MT CO_2e)
- 2050 – 162% higher than 1990 levels (1,607,798 MT CO_2e)



EMISSION REDUCTION GOALS

Yolo County has made considerable effort to select emission reduction targets and goals that are both ambitious and practical. Reaching these targets will contribute to



both California's GHG reduction goals and international climate protection efforts. Yolo County seeks to reduce GHG emissions to:

- 1990 levels by 2020 (mandatory target)
- 27% below 1990 levels by 2030 (goal)
- 53% below 1990 levels by 2040 (goal)
- 80% below 1990 levels by 2050 (goal)

The figure on page ix illustrates the difference in future GHG emissions levels for the unincorporated area of Yolo County, depending on whether or not the CAP is implemented. Between 1990 and 2008, the line showing total emissions rises gradually, reflecting the County's slow population growth during this period (0.05% annual increase on average).

Beginning with the adoption of the General Plan, however, the projected future emissions begin to climb rapidly, as growth planned in the Dunnigan and Madison Specific Plans, and in Esparto starts to build out. Without the CAP, this development would occur without increased building construction standards, without the expansion of solar technology, or without an emphasis on smart growth and alternative transportation. As a result, GHG emissions are projected to more than double by 2030.

With implementation of the CAP, total emissions begin to go down in 2008, even as Dunnigan, Madison, and Esparto expand. Homes and businesses will be built with higher insulation values, water conservation features, Energy Star appliances, solar water heaters, and photovoltaic systems. Communities will incorporate higher densities and mixed uses, with neighborhoods that are interconnected by pathways and complete streets. Between 2008 and 2030, the CAP will cut GHG emissions by about 30%, even as the unincorporated population more than doubles in size.

CAP REDUCTION POTENTIAL

The CAP contains 15 primary measures that will help the unincorporated area achieve GHG reductions and successfully adapt to climate change. To ensure implementation of these measures, specific action steps, performance targets, responsible parties, timeframes, and estimates of emission reduction potential are provided. The CAP also contains 19 supporting measures, which provide important climate protection benefits, but at the time of plan preparation, could not be counted toward reduction targets.

The CAP defines a mandatory 2020 reduction target, and 2030, 2040, and 2050 GHG reduction goals for unincorporated Yolo County. Estimates of GHG reduction potential in 2020 are important to demonstrate the County's contribution toward implementation of Assembly Bill (AB) 32 addressing climate protection requirements. The goals for 2030, 2040, and 2050 achieve the thresholds set by the Governor's Executive Order S-3-05, as well as the County's own commitment as detailed in the Cool Counties initiative. Table ES-1 shows the reduction potential by CAP strategy for 2020 and 2030. Table ES-2 identifies the specific actions the County will rely on to reduce GHG

By 2020, County actions combined with State and federal programs have the potential to reduce emissions in the unincorporated area by about 382,624 MT CO_2e/yr, or 0.4% below 1990 emission levels. By 2030, the reductions are expected to increase to 946,992 MT CO_2e/yr, or 27% below 1990 levels.

Table ES-1: GHG Reduction Strategies and Associated Reductions

Strategy	2020 (MT CO_2e/yr)	2030 (MT CO_2e/yr)
Agriculture Strategy	*29,603*	*104,010*
Transportation and Land Use Strategy	*42,018*	*84,035*
Building Energy Strategy	*180,425*	*283,033*
Solid Waste and Wastewater Strategy	*9,366*	*13,649*
Supporting Measures	*Not included in 2020 target*	*209,244*
State Level Reductions	*121,212*	*253,021*
TOTAL GHG REDUCTIONS	**382,624 0.4% below 1990 levels**	**946,992 27% below 1990 levels**

emissions, in descending order by reduction potential for 2020 and 2030.

2020 Reduction Potential

Table ES-1 shows that in 2020, State and federal legislation and implementation of the CAP measures have the potential to reduce emissions in the unincorporated area by about 382,624 MT CO_2e/yr, or 0.4% below 1990 emission levels. This level of reduction meets the County's established 2020 target and complies with recommended reduction levels for local governments.

2030 Reduction Potential

State and federal legislation combined with County actions have the potential to reduce emissions in the unincorporated area by 946,992 MT CO_2e/yr, or 27% below 1990 levels. This meets the County's 2030 goal and puts the County on a successful trajectory toward achieving the 2050 goal.

Reduction Strategies

The range of feasible and practical actions available to the County for reducing GHG emissions is fairly limited. Metropolitan areas that have allowed urban sprawl over the past several decades have very high GHG emissions, but they also have a greater array of options for reducing emissions through density, infill, mixed use development, improved energy conservation standards, public education, and alternative transportation. In contrast, Yolo County has historically followed a pattern of managed growth and agricultural/open space preservation.

Table ES-2: County Actions by 2020 (Primary Measures)

Performance Indicator	MT CO_2e/yr	Percent of Total
Community choice aggregation program results in 50% of county relying on 50% renewable, and 25% of county relying on 100% renewable	**117,285**	**45%**
100% of Dunnigan, 60% of Madison, 50% of Esparto, 33% of Elkhorn, and 25% of Knights Landing achieve 44 VMT	**42,018**	**16%**
Require 97.5% of new buildings (residential over 3,500 square feet [excluding affordable housing] and non-residential [after 2013]) to be 15% above Title 24 2% of new buildings (residential and non-residential) at 30% above Title 24 0.5% of new buildings (residential and non-residential) at zero-net energy consumption	**31,852**	**12%**
Require 90% of new (excluding affordable housing) and 5% of existing homes to have photovoltaic systems Require all new (after 2013) and 200,000 square feet of existing commercial to have photovoltaic systems Require 90% of new (excluding affordable housing) and 15% of existing residential units to install solar water heaters Require all new (after 2013) and 5% of existing commercial to install solar water heaters	**24,870**	**10%**
Reduce 90% of manure methane emissions from 100% of confined livestock	**12,370**	**5%**
Convert 40% of irrigation return pumps to solar electric energy and improve 10% of groundwater pumps to reduce energy 33%	**9,396**	**4%**
Landfill captures 90% of methane	**9,366**	**4%**
Reduce nitrogen application rates by 6%	**4,132**	**2%**
Retrofit 20% of residential units to reduce energy 15% Retrofit 10% of non-residential buildings to reduce energy 20%	**3,948**	**2%**
Restore 1,100 acres of riparian forest Establish 50 miles of new hedgerow Establish new orchards: 537 acres almonds, 446 acres walnuts, 1,340 acres olives	**2,527**	**1%**
Improve water fixture/fixture fitting efficiency by 15% in 100% of residential units built prior to 1994 Reduce water consumption by 6% through leak repair in 40% of existing residential units and commercial buildings	**2,103**	**1%**
5% of farm equipment improves fuel efficiency by 6% and 25% of farm equipment improves fuel efficiency by 5%	**1,142**	**<1%**
Generate 1MW of renewable energy on farms in unincorporated County (excluding solar water pumps)	**316**	**<1%**
Reduce landscape water consumption by 20% in 2% of residential units Reduce landscape water consumption by 20% in 5% of commercial buildings	**51**	**<1%**
Eliminate methyl bromide application	**36**	**<1%**
Total	**261,412**	**100%**

Table ES-2 Continued: County Actions by 2030 (Primary Measures)

Performance Indicator	MT CO_2e/yr	Percent of Total
Community choice aggregation program results in 75% of county relying on 50% renewable, and 25% of county relying on 100% renewable	**145,884**	**30%**
100% of Dunnigan, 60% of Madison, 50% of Esparto, 33% of Elkhorn, and 25% of Knights Landing achieve 44 VMT	**84,035**	**17%**
Require 86% of new buildings (residential over 3,500 square feet [excluding affordable housing] and non-residential [after 2013]) to be 15% above Title 24 12% of new buildings (residential and non-residential) at 30% above Title 24 2% of new buildings (residential and non-residential) at zero-net energy consumption	**67,200**	**14%**
Restore 2,000 acres of riparian forest Establish 100 miles of new hedgerow Establish new orchards: 1,146 acres almonds, 891 acres walnuts, 2,860 acres olives	**60,033**	**12%**
Require 100% of new (excluding affordable housing) and 10% of existing homes to have photovoltaic systems Require 100% of new (after 2013) and 300,000 square feet of existing commercial to have photovoltaic systems Require 100% of new (excluding affordable housing) and 40% of existing residential units to install solar water heaters Require 100% of new (after 2013) and 10% of existing commercial to install solar water heaters	**52,032**	**11%**
Convert 90% of irrigation return pumps to solar electric energy and improve 10% of groundwater pumps to reduce energy 33%	**18,949**	**4%**
Landfill captures 90% of methane	**13,649**	**3%**
Retrofit 70% of residential units to reduce energy 15% Retrofit 30% of non-residential buildings to reduce energy 20%	**12,322**	**3%**
Reduce 90% of manure methane emissions from 100% of confined livestock	**12,035**	**2%**
Reduce nitrogen application rates by 15%	**10,054**	**2%**
Improve water fixture/fixture fitting efficiency by 20% in 100% of residential units built prior to 1994	**4,100**	**1%**
5% of farm equipment improves fuel efficiency by 6% through operation and maintenance 75% of farm equipment improves fuel efficiency by 5% through improvements to equipment	**2,903**	**1%**
Reduce landscape water consumption by 20% in 25% of residential units Reduce landscape water consumption by 20% in 50% of commercial buildings	**862**	**<1%**
Generate 2MW of renewable energy on farms in unincorporated County (excluding solar water pumps)	**632**	**<1%**
Eliminate methyl bromide application	**36**	**<1%**
Total	**484,727**	**100%**

While this has resulted in a very small increase in GHG emissions since 1990 (only 6% over 18 years), it also leaves us with few opportunities for improvement, particularly for the dramatic decrease needed to comply with long-term targets to reduce emissions to 80% below 1990 levels by 2050.

With dispersed, low-density rural communities, significant reductions in the energy and transportation sectors are unachievable. Agriculture represents nearly half of the GHG output, but any large emission reductions would require extensive shifts in cropping patterns and operations that would have widespread economic impacts to the County's primary industry. As a result, the focus of the CAP's efforts is directed toward the building energy sector. Figure ES-4 demonstrates that energy conservation and alternative energy measures achieve the majority of the anticipated reductions in both 2020 (47%) and 2030 (30%). In particular, the Community Choice Aggregation program is the single most important measure in the CAP, accounting by itself for 31% of GHG reductions in 2020 and 15% in 2030.

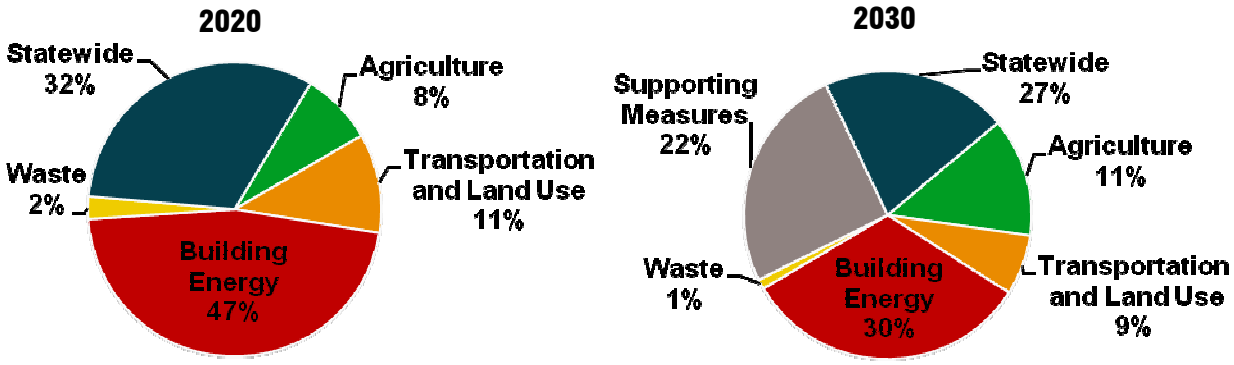
The smart growth policies contained throughout the General Plan including the VMT policy in the Circulation Element are expected to reduce vehicle emissions and provide approximately 11% of total reductions in 2020 and 9% in 2030.

The third largest source of GHG reductions (approximately 8% in 2020 and 11% in 2030) will occur within the agriculture sector. Measures that reduce use of nitrogen fertilizer, field equipment fuel consumption, and irrigation-related energy use provide the primary reductions.

The solid waste measure provides 2% of reductions in 2020 and approximately 1% in 2030 by increasing methane capture within the County landfill.

State and federal actions will provide about one-third of overall reductions in 2020, and more than one-quarter in 2030. Improving light and medium duty vehicle fuel efficiency, increasing use of lower carbon fuels, and implementing the renewable energy portfolio standard for utility electricity generation will provide most of these statewide reductions.

Figure ES-4: Greenhouse Gas Reductions by Strategy Area



Ensuring that the measures translate to on-the-ground results is critical to the success of the CAP. Each primary measure identifies responsible departments and specific actions the County will need to implement.

Supporting measures provide about 22% of total reductions in 2030.

ADAPTATION

Two types of responses to climate change are available: mitigation and adaptation. Most of the CAP addresses mitigation, or reducing GHG emissions to help limit future human activity-induced climate change. Adaptation (i.e., preparing for and managing risks associated with climate change) is addressed in a separate section. Anticipated climate change effects in Yolo County include temperature rise, change in precipitation patterns, impacted water resources, increased risk of wildfires, sea level rise in the Delta, and extreme weather events. There is a large scientific consensus about general categories of climate change effects and their likely consequences over continent-scale geography; however, understanding of the magnitude, timing and region-scale geographic effects and the interrelationships between them is still evolving.

Adaptation measures establish a basic framework for integrating climate change risk assessment and management into current planning processes, culminating in an adaptation planning framework to guide preparation for the effects of climate change in Yolo County. Measures address agriculture, water resources, sea level rise, and health risks. Where appropriate, strategies highlight GHG reduction measures that also address adaptation.

IMPLEMENTATION

Ensuring that the measures translate to on-the-ground results is critical to the success of the CAP. To facilitate this, each primary measure identifies responsible departments and specific actions the County will implement. Each primary measure also describes performance targets for both 2020 and 2030 that enable staff, the Board of Supervisors, and the public to monitor the effectiveness of each measure as well as the overall CAP. The identified County departments will be responsible for implementing assigned actions upon adoption of the CAP.

MONITORING

The CAP represents the County's best efforts to address the threat of global climate change through a well organized and comprehensive response within the unincorporated County. The CAP lays out a broad-based strategy to significantly reduce GHGs and improve sustainability. County staff will evaluate plan performance over time and make recommendations to alter or amend the plan if it is not achieving the proposed reduction targets. The Planning Division will monitor overall CAP effectiveness and report to the Board of Supervisors every two years beginning in 2013, to ensure that emission reduction targets are being met. Updates to the inventories will occur every five years, beginning in 2015.

The County will amend the General Plan to incorporate key components of this CAP and its measures and actions by reference. As a part of the General Plan, the CAP will become a fundamental consideration in land use decisions. However, by adopting the CAP as a stand-alone implementation document, it will retain the flexibility needed to respond to changing circumstances.

1 INTRODUCTION

PLAN FOUNDATIONS

Yolo County has adopted a strong commitment to the reduction of greenhouse gas (GHG) emissions. The County was an early advocate of responsible planning with its long-time commitment to growth management and its adoption in 1982 of a countywide Energy Plan.

Concepts of smart growth, and climate change conscious policies and actions, are prominent in the newly adopted 2030 Yolo County General Plan. The County's policy commitment to the goals of protecting both agricultural land and open space, and directing the majority of future growth to existing cities and communities discourages sprawl and encourages density, infill, compact community design, and development along movement corridors. It also allows for local food production and alternative transportation opportunities. Climate change policies and actions (more than 350 of them in total) appear in every element of the General Plan. In addition, the Conservation and Open Space Element contains individual sections addressing climate change and energy conservation.

The Yolo County Climate Action Plan (CAP) is an implementation action of the 2030 General Plan. Of particular importance in the General Plan are the following two actions:

Action CO-A117: *Develop a GHG Emissions Reduction Plan and/or Climate Action Plan (CAP) for the County, to control and reduce net GHG emissions, and to address economic and social adaptation to the effects of climate change. Development of this plan(s) shall include the following steps:*

1. Conduct a baseline analysis (GHG emissions inventory) for 1990, or most appropriate baseline year;
2. Adopt an emissions reduction target;
3. Develop strategies and actions for reducing emissions including direct offsets and fees to purchase offsets;
4. Develop strategies and actions for adaptation to climate change;
5. Implement strategies and actions; and
6. Monitor emissions and verify results a minimum of every five years starting in 2010.

Utilize the 1982 Energy Plan as a starting point for this effort. Encourage collaboration with the cities to include the incorporated areas in the plan(s). Amend the General Plan to include the plan(s) after adoption. Require County operations and actions, as well as land use approvals to be consistent with this plan(s). This plan must be in place prior to adoption of any specific plan. (Policy CO-8.1)

Action CO-A118: *In the interim until the GHG Emissions Reduction Plan/CAP is in effect, the following significance thresholds shall be used for project analysis:*

- *Projects consistent with the General Plan and otherwise exempt under CEQA – Assumed to be de minimus.*
- *Projects consistent with the General Plan and subject to CEQA – Net zero threshold to be achieved by the applicant as follows*:
    - *Apply practical and reasonable design components and operational protocols to reduce project emissions to the lowest feasible levels;*

- *Use verifiable offsets to achieve remaining GHG reductions. To the greatest feasible extent, offsets shall be: locally based, project relevant, and consistent with other long term goals of the County (Policy CO-8.9).*

CALL TO ACTION—STATE AND LOCAL LEADERSHIP

The world's leading climate change experts have identified three critical factors related to the Earth's changing climate:

- Atmospheric concentrations of carbon dioxide, methane, nitrous oxide and other GHGs have increased dramatically since 1750 and now far exceed pre-industrial values,
- Global average temperatures have increased markedly over the last 100 years due to the increased GHG concentrations, and
- Human-caused GHG emissions are the primary driver behind the global warming process (IPCC, 2001).

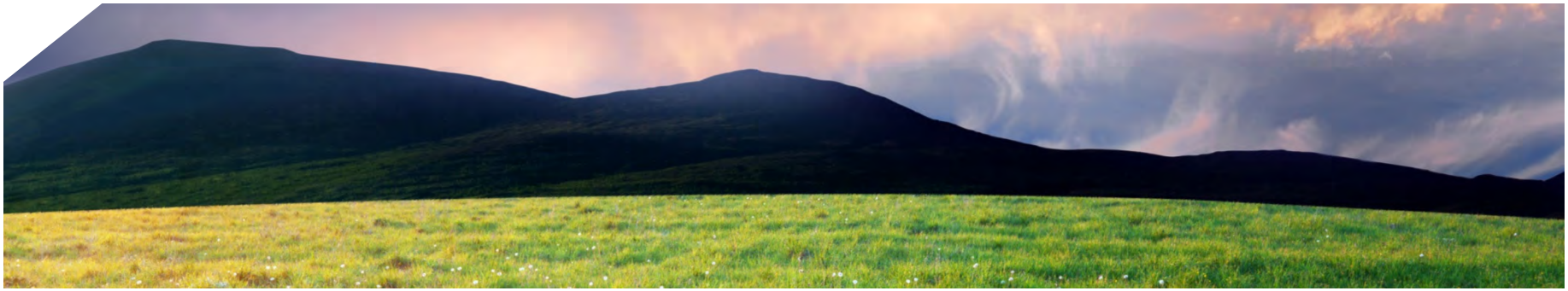
While some level of GHGs are essential to life on earth, emissions from burning fossil fuels, deforestation, methane-producing activities, and other causes have increased the concentration of GHGs. Most climate scientists agree that in order to avoid dangerous climate change, atmospheric GHG concentrations need to be stabilized at 350–400 parts per million (ppm). Global atmospheric carbon dioxide concentrations have already passed the 350 ppm and are fast approaching 400 ppm. Actions in the next decade will determine to how far we exceed these recommended levels.

Potential Effects of Climate Change in Yolo County

The State has extensively analyzed the potential effects of climate change. This research identifies a strong likelihood that considerable warming will occur within the next the century. Certain effects may already be occurring.

Some anticipated consequences of climate change in Yolo County include:

- Rising temperatures, leading to increased electricity use for cooling, especially in the summer. By 2020, this could result in a 1% to 3% increase in electricity demand (CEC, 2007).
- Warm-season horticultural crops (e.g., tomatoes, cucumbers, sweet corn, and peppers) could be less viable by 2050. This may prompt a shift to hot-season crops such as melon and sweet potato.
- Climate change could worsen air quality by increasing emissions, accelerating chemical processes, and raising inversion temperatures during summer periods of air stagnation.
- Sea level is expected to rise above present levels by 55 inches or more during the next 100 years. This would exacerbate flooding in already vulnerable regions of Yolo County. Combined with increased potential for winter flooding, this could threaten the structural integrity of levee and flood control systems, which would place more people and property at risk from flooding.



State Leadership

California is a leader in global climate protection efforts. The State has adopted a wide variety of regulations aimed at reducing statewide GHG emissions. While these actions alone cannot stop climate change, implementation of the following legislation will play a critical role.

Assembly Bill 32

Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, requires California to reduce statewide GHG emissions to 1990 levels by 2020. AB 32 directs the California Air Resources Board (ARB) to develop and implement regulations that reduce statewide GHG emissions, institute a schedule to meet the emissions target, and develop tracking, reporting, and enforcement tools to ensure that California achieves the required emission reductions.

Climate Change Scoping Plan

The Climate Change Scoping Plan (Scoping Plan) was approved by ARB in December 2008 and outlines the State's plan to achieve the GHG reductions required in AB 32. The Scoping Plan contains the primary strategies California will implement to achieve a reduction of 169 MMT CO_2e, or approximately 28% from the State's projected 2020 emission levels.

Executive Order S-3-05

Executive Order S-3-05 (EO-S-3-05) states that California is vulnerable to the effects of climate change, including reduced snowpack in the Sierra Nevada Mountains, exacerbation of California's existing air quality problems, and sea level rise. To address these concerns, the executive order established statewide targets to reduce GHG emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80% below 1990 levels by 2050.

Senate Bill 375 (2008)

Senate Bill (SB) 375 aligns regional transportation planning efforts, regional GHG reduction targets, and land use and housing allocations to reduce vehicle emissions. The State has assigned passenger vehicle per capita GHG reduction targets to each Metropolitan Planning Organization (MPO). Within the

Yolo County's Commitment to Energy Conservation

1982: Energy Plan adopted to support energy conservation, promote renewable energy, and protect the County from volatile energy prices.

1985: Landfill gas-to-energy facility completed at the Yolo County landfill, generating 20,000 kWh per year and eliminating more than 90% of methane emissions.

2009: Joined California FIRST's Property Assessed Clean Energy (PACE) program to provide low-interest financing for energy efficiency and renewable energy improvements.

2010: One-megawatt solar farm installed at the Yolo County Justice Center.

2010: Established Energy Watch partnership, an outreach program to reduce countywide building energy use.

Yolo County has a well-earned reputation for climate protection leadership. The County is a leading advocate of responsible growth and agricultural preservation. In addition, the County has taken numerous steps to reduce emissions associated with County government operations.

Sacramento Area Council of Governments (SACOG) region, these targets are a 7% reduction by 2020 and a 16% reduction by 2030 compared to 2005 baseline levels of 23.0 lbs of CO_2 per capita per weekday.

Senate Bill 97 (2007)
SB 97 acknowledges that climate change is a prominent environmental issue that requires analysis under the California Environmental Quality Act (CEQA). Pursuant to SB 97, the State CEQA Guidelines were updated in 2010 to include provisions for mitigating GHG emissions and/or the effects of GHG emissions. The amended CEQA Guidelines (Section 15183.5) allow jurisdictions to analyze and mitigate the significant effects of GHGs at a programmatic level by adopting a plan for the reduction of GHG emissions. Later, as individual projects are proposed, project-specific environmental documents may tier from and/or incorporate by reference that existing programmatic review in their cumulative impacts analysis. This CAP has been developed specifically for this purpose.

Yolo County Leadership

Yolo County has a well-earned reputation for climate protection leadership. The County is a leading advocate of growth management, coupled with a strong commitment to agricultural preservation. The 1982 Energy Plan demonstrated the County's historic and long-term commitment to energy conservation. In addition, Yolo County has taken numerous steps to reduce emissions associated with County operations.

Recently, the County's efforts have included joining the Cool Counties Climate Stabilization Declaration, leading the Yolo County Climate Change Compact, and completing a General Plan update that fully integrates policies and programs into every element that reduce GHG emissions (see appendix D for a list of these General Plan policies).

Cool Counties
In September 2007, the Board of Supervisors unanimously approved a resolution declaring that Yolo County was joining with 13 other counties in the United States to participate in the Cool Counties Climate Stabilization Declaration. Yolo County was one of the charter members in this initiative, and voluntarily committed to seek to reduce GHG emissions by 80% by 2050.

Yolo County Climate Change Compact
Recognizing that coordinated climate protection efforts would increase the effectiveness of each jurisdiction's efforts, Yolo County organized the countywide Climate Change Compact. Compact members include the unincorporated county, cities, school districts, University of California, and other special districts. Since 2007, the working group has met multiple times per year and exchanged ideas on best practices related to preparing inventories and reducing GHG emissions.

Yolo County General Plan
The Yolo County General Plan, rewritten in 2009, contains over 350 policies and programs aimed at reducing GHG emissions in the unincorporated County and responding to the potential effects of climate change. The General Plan

The Yolo County General Plan contains over 350 policies and programs aimed at reducing GHG emissions in the unincorporated County and responding to potential effects of climate change.

continues land use patterns that strongly encourage mixed use development, compact communities, and alternative transportation for new growth planned through 2030 in Yolo County. General Plan policies also provide direction regarding agricultural preservation, habitat conservation, open space protection, sustainable building design standards, complete streets, and other smart growth concepts.

General Plan Action CO-A117 requires the County to prepare and adopt a CAP. This CAP builds on the foundation provided in the 2030 General Plan and defines specific actions necessary to achieve GHG reduction and climate adaptation goals.

County Achievements to Date
Yolo County has already implemented a variety of successful actions that reduce GHG emissions. Notable examples include the following:

Energy Efficiency - Yolo County has implemented a wide array of energy efficiency improvements in County buildings, including replacing incandescent

lights with compact fluorescent bulbs, retrofitting equipment, installing computerized climate controls, installing cogeneration capacity at the Monroe Detention Facility, and developing a building closure program to retire less energy-efficient buildings. The County has also established an appliance replacement program for Energy Star appliances in County buildings and facilities. The County has established a goal of 10% annual reduction in energy use for government operations through 2013.

- **Landfill Gas to Energy Facility** - The County recovers methane from the Central Landfill to generate electricity and reduce the global warming potential of its landfill gas emissions.
- **Green County Buildings** - The County has adopted Leadership in Energy and Environmental Design (LEED) standards for all new County buildings.
- **Recycling** - All County buildings have recycling programs. The County also has also adopted a Construction and Demolition Recycling Ordinance that requires 50% of all construction and demolition debris to be diverted or recycled.
- **Agricultural Marketing** - The Agriculture Commissioner has initiated an agricultural marketing program to reduce "food miles," and associated emissions.
- **Transportation and Fleet Vehicles** - The County has installed charging stations for electric vehicles and uses electric vehicles for commuting between County facilities.
- **Tree Planting** - The County operates a small nursery providing tree planting for County facilities.

COMMUNITY INPUT

The County has undertaken considerable public outreach as a part of preparing the CAP. The following summarizes various efforts in this regard:

Agricultural/Rural/Open Space Stakeholders

The agricultural sector in Yolo County generates more GHG emissions within the unincorporated area than any other sector. This contrasts with the state as a whole and with most communities where the transportation sector is the largest emitter. As such it was recognized early in the process that this sector would have an important role in assisting with the development of the CAP and accomplishing necessary reductions. In light of this, the County created a stakeholder group to provide input to the process.

The County invited the stakeholder group to participate in workshops to discuss development of the CAP. Stakeholders offered initial reduction ideas, and the agricultural research community offered valuable technical support and assistance to the County's efforts to quantify agricultural emissions and reductions.

The stakeholder group met twice while the CAP was being prepared. Climate action

ideas within each agricultural subsector (i.e., livestock emissions, fuel and off-road equipment, nitrogen emissions, rice, and irrigation) were discussed at the first meeting in April 2010. Comments received at this meeting were incorporated into the development of preliminary measures. Emissions inventory results and preliminary CAP measures were presented and discussed at the second workshop in July 2010. The preliminary measures were refined and actions were developed based on the feedback received.

Yolo County Climate Compact Meetings
The County also discussed the CAP at three meetings of the Yolo County Climate Compact in April, June, and August 2010. The purpose of these meetings was to both ensure awareness of the County's efforts, and to ensure coordination on key assumptions. Compact members provided valuable feedback on these items which was incorporated in the CAP.

Dunnigan Specific Plan Developer Group
The Dunnigan Specific Plan (DSP) is the largest growth area in the 2030 General Plan and the County has received a preliminary application for the Dunnigan Specific Plan (DSP) from the Dunnigan Landowner Group (applicants). As part of the overall project, the applicants have funded a portion of the consultant costs for preparation of the CAP. The CAP is required to be in place prior to adoption of the DSP, and the DSP is required to include consistent climate action efforts. It Is anticipated that the DSP will be responsible for the bulk of the CAP action items related to new growth.

Staff met with the DSP representative in July 2010 to coordinate regarding appropriate growth assumptions for the DSP area, and also in September 2010 to provide an update on the CAP efforts and direction to ensure incorporation of appropriate CAP strategies into the Draft DSP.

Planning Commission Workshop
In August 2010, the CAP process, preliminary measures, and stakeholder feedback were presented to the Yolo County Planning Commission in a public meeting. Commissioners listened to public comments and provided input regarding the inventory, projections, and preliminary reduction measures. This input was utilized in the development of the CAP.

AGENCY CONSULTATION

To ensure compliance with various state, regional, and local requirements, as well as to collaborate on strategies to achieve mutual goals, the County has worked closely with a variety of government organizations in preparing the CAP. These efforts are summarized as follows.

Attorney General's Office
The State Attorney General has played a significant role in increasing awareness of climate change issues and the relationship of those issues to local land use control. Representatives of the Attorney General's office were briefed during the County's General Plan Update process regarding the GHG analysis in the EIR and the subsequent preparation of the CAP. In July 2010, staff and representatives of the Office met again to review the development of the CAP, including the proposed

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AP.

methodology and reduction targets. A third meeting was held in December 2010 to discuss the draft reduction strategy. To date, the Attorney General's Office has been supportive of the County's efforts, methodologies, and approach.

Sacramento Area Council of Governments
The majority of the CAP development costs were funded through a grant from the Sacramento Area Council of Governments (SACOG). County staff updated SACOG regularly regarding progress on the CAP as a requirement of the grant program. In addition, meetings with SACOG staff were held in June 2010 to discuss the CAP effort, including efforts needed to ensure local CAP inventories are consistent with the SACOG regional inventory, and the implementation of both AB 32 and SB 375. There was also discussion regarding efforts to utilize the Yolo County methodology for the agricultural sector as a model for the rest of the SACOG region.

Successful implementation of the CAP will require cooperation among the County, other jurisdictions, agencies, local businesses, residents, and private organizations.

Yolo Solano Air Quality Management District
The Yolo-Solano Air Quality Management District (YSAQMD) implements State and federal air quality regulations for the region through authority delegated from the ARB. County staff met with YSAQMD staff prior to commencing the CAP and met again in August 2010 to update YSAQMD regarding the County's progress.

Yolo County Departments
Staff and the consultant team have worked directly with the following County departments and divisions to coordinate regarding the CAP and related efforts: County Administrator's Office, County Counsel, Public Works, Integrated Waste Management, Natural Resources, Economic Development, General Services, and Agricultural Commissioner.

WORKING TOGETHER – COORDINATION WITH OTHER YOLO COUNTY PARTNERS

Achieving the County's ambitious reduction targets will require extensive cooperation among the County, other jurisdictions, agencies, and local businesses, residents, and private organizations. Building upon existing collaborative relationships and developing new partnerships will be critical to the successful implementation of the CAP.

Implementation of many of the agriculture reduction mechanisms and actions will depend upon involvement from farmers, university extensions and researchers, the Natural Resource Conservation Service (NRCS), the Yolo County Resource Conservation District (RCD), the Farm Bureau, the Agricultural Futures Alliance, and other organizations.

Communication and partnership with SACOG, Caltrans, Yolo County Transit District, and the Yocha Dehe Wintun Nation will be necessary to effectively implement many of the transportation reduction actions.

Energy efficiency and renewable energy programs work best when implemented at appropriate scales. Partnering with the cities of Davis, West Sacramento, Winters, and Woodland and utilities and service providers could reduce cost and improve feasibility of these programs. Inter-jurisdictional cooperation will be especially important if the County implements the proposed community choice aggregation (CCA) program. Partnering with cities and neighboring counties could provide economies of scale for many of these programs.

Partnering with researchers at the University of California and other State agencies will provide state-of-the-art information related to the carbon mitigation potential of agriculture, inventory methodology and mitigation, and climate change adaptation.

Other Climate Protection Efforts in Yolo County

City of Davis:

In 1999, Davis joined a small group of cities calling for local action and a national policy on climate change. In 2010, Davis adopted a CAP that seeks to reduce communitywide emissions to 1990 by 2010, to 28% below 1990 levels by 2020, and to reach carbon neutrality by 2050.

City of West Sacramento:

West Sacramento was one of the first cities to join the US Mayor's Climate Change Initiative. The City has developed an inventory of its current energy use and has already begun to implement various GHG reduction strategies and is preparing a CAP. The City has also partnered with the Port of West Sacramento to reduce emissions and install renewable energy production systems.

City of Winters:

Winters has implemented a wide variety of transportation, energy, and solid waste programs to reduce GHG emissions.

City of Woodland:

Woodland has prepared a baseline emissions inventory of energy use and resulting GHG emissions. The Environmental Services department is in the process of developing the City's first energy conservation and climate action plan and associated programs.

University of California, Davis:

UC Davis has prepared a Climate Action Plan that outlines strategies to reduce campus emissions to 10.5% below 2008 levels by 2014 and 39.4% below 2008 levels by 2020.

CTION

Measuring past and present greenhouse gas (GHG) emission levels is a critical first step in the development of the climate action plan. Without these benchmarks, the County cannot determine appropriate future targets. Furthermore, identifying the sources, distribution, and magnitude of emissions allows the County to develop the specific measures and actions needed to achieve those targets, by addressing various emission-generating activities.

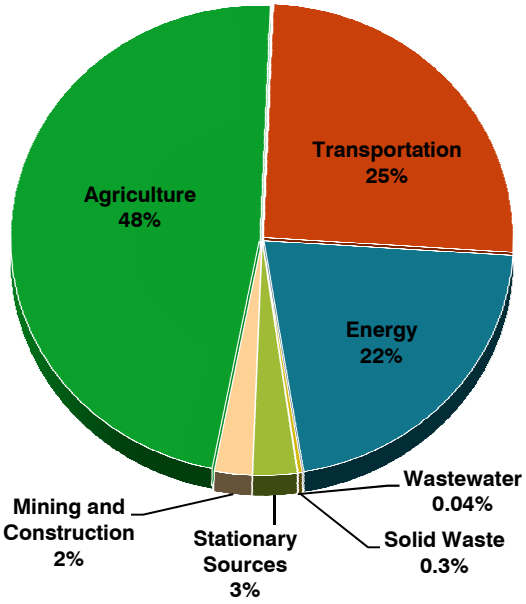
This chapter describes communitywide GHG emissions inventories for unincorporated Yolo County in 1990 and 2008. Emission projections for 2020, 2030, 2040, and 2050 are provided, as well as emission reduction targets and goals for each year. The role of anticipated State and federal actions is included in the discussion of future emission projections. A description of the methods and sources of information used to complete the inventories and projections is provided in Appendix A.

EMISSION INVENTORIES

The County prepared communitywide GHG emissions inventories by key sector for the unincorporated County for both 1990 and 2008. The inventories do not include emissions for the four incorporated cities, independent special districts, school districts, UC Davis, tribal lands, or state and federally-owned lands. Each of these entities is responsible for preparing their own inventory and Climate Action Plan (CAP). The 1990 inventory provides a "historic baseline" for determining the level of emission reductions necessary to comply with State requirements. The 2008 inventory measures emissions growth between the historic baseline and the adoption of the 2030 General Plan, providing an "existing conditions" reference. The sectors analyzed represent categories of emissions that are commonly used within climate change research and analysis, as follows:

- **Agriculture** – Emissions from off-road farm equipment, irrigation pumps, residue burning, livestock, pesticide application, rice cultivation, lime and urea application, and fertilizer volatization.

Figure 2-1: 1990 Unincorporated Yolo County Greenhouse Gas Emissions by Sector



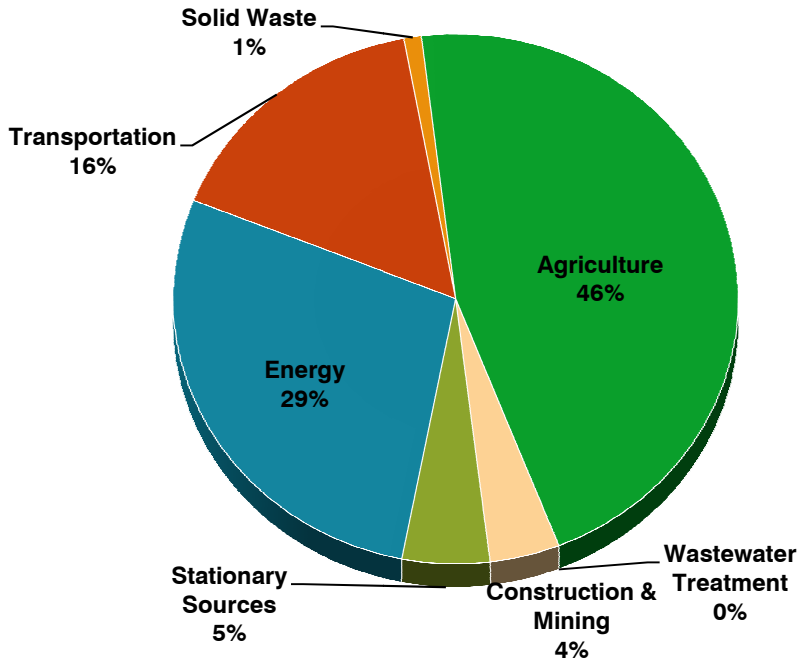
- **Energy Consumption** – Emissions from electricity production, natural gas and propane combustion, and domestic water consumption.
- **Transportation** – Emissions from vehicles traveling on highways and roadways within the County, adjusted to deduct trips that did not start and/or finish in the County (all external/external and half of external/internal)
- **Solid Waste** – Emissions from disposal at the Yolo County Central Landfill.
- **Wastewater Treatment** – Methane emissions from secondary treatment wastewater facilities. Tertiary treatment facilities, which do not have GHG emissions, are captured in the energy consumption sector.
- **Stationary Sources** – Industrial and commercial facilities, such as manufacturing facilities, wineries, food processing plans, etc.
- **Construction and Mining** – Emissions associated with on-site use of heavy duty equipment. Emissions associated with the land use itself, such as other transportation emissions or energy use, are captured in other relevant sectors.

1990 Historic Emissions Inventory

In 1990, the unincorporated portions of Yolo County generated an estimated 613,651 metric tons (MT) of carbon dioxide equivalent (CO_2e) emissions. Table 2-1 and Figure 2-1 summarize this level of emissions and the contribution of each activity sector.

Agriculture-related activities made up about half of the 1990 emissions. Transportation of goods and people accounted for approximately 25%, while energy consumption made up about 22%. Solid waste and wastewater treatment activities contributed less than 1%. Non-jurisdictional emissions, including the mining/ construction sector and stationary-source sectors, made up approximately 5% of the total.

Figure 2-2: Unincorporated Greenhouse Gas Emissions by Sector in 2008

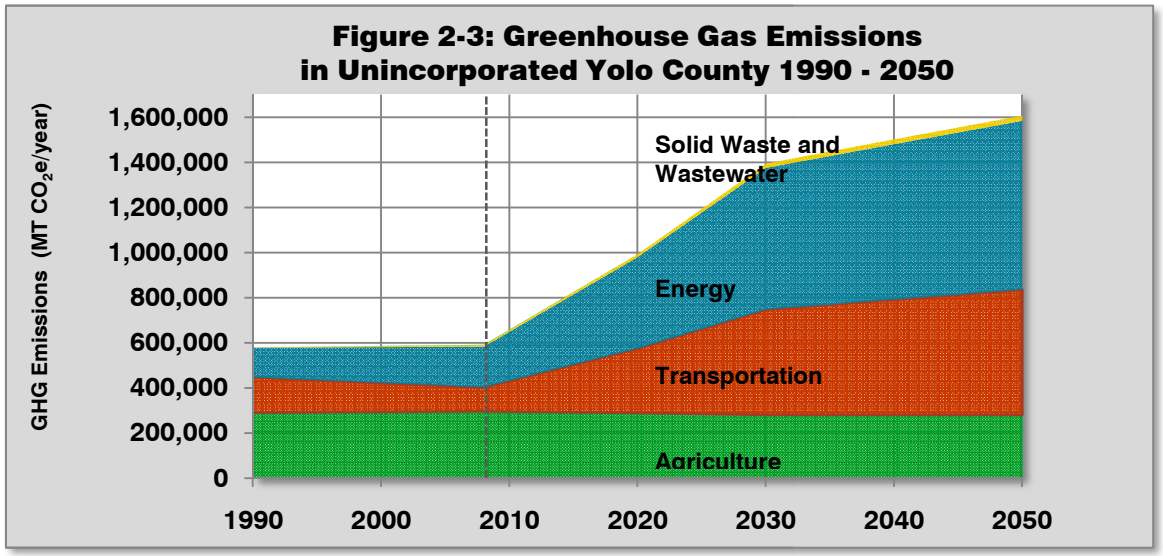


2008 Emission Inventory

Between 1990 and 2008, GHG emissions in the unincorporated County grew by about 6% to an estimated 651,740 MT CO_2e. The largest increase occurred within the energy sector, where emissions grew by 38% (approximately 50,000 MT CO_2e). Population growth and higher levels of household eergy use were the primary drivers of this increase. Agricultural emissions grew by about 1.8% (approximately 5,300 MT CO_2e). While emissions decreased in many agricultural subsectors, the addition of thousands of acres of rice cultivation, additional livestock, and more lime application to agricultural soils led to an overall increase.

Solid waste and wastewater emissions more than doubled, growing by 315% and 280% (approximately 5,000 MT CO_2e and 700 MT CO_2e) respectively. Growth in solid waste-related emissions can be attributed to both growth in volume disposed associated with new growth, and the contribution from waste that has accumulated at the landfill over the last 18 years. Similarly, mining/construction and stationary-source emissions grew by 96% and 75% respectively. The increase in emissions from the mining/construction sector is attributable to an increase in the size of the construction equipment fleet within the incorporated area. The increase in stationary-source emissions is associated with a change in the type of facilities and their associated throughput in the County. Each of these sectors, however, represents a very small contribution to overall emission levels. Between 1990 and 2008, transportation-related emissions decreased by 32% from trips within unincorporated areas (approximately 50,300 MT CO_2e). While overall household vehicle travel increased during this period, emissions decreased because some areas of the County that were unincorporated in 1990 were annexed into cities. Thus, these emissions are no longer attributed to the County. Increased fuel efficiency also contributed to the decrease.

Figure 2-3: Greenhouse Gas Emissions in Unincorporated Yolo County 1990 - 2050



There are approximately 14,855 acres of wetlands currently in Yolo County. Nearly all of this wetland development has occurred over the past 20 years. In recent years, the pace of wetland creation has occurred at a faster rate than urbanization. Since 2008, several new projects have been approved, primarily adjoining the Sacramento River and in the lower Yolo Bypass. Consequently, wetlands are playing an increasing role related to GHG emissions and climate change.

Wetlands sequester carbon in vegetation and inundated soils through the process of CO_2 uptake from the atmosphere, photosynthesis, and decomposition. Wetlands also result in the generation of GHGs including methane (CH_4), which has global warming potential 21 times that of CO_2, from the anaerobic decomposition of biomass (e.g., bacteria); nitrous oxide (N_2O) from nitrification and denitrification processes; and CO_2, CH_4, and N_2O from peat soil subsidence and oxidation associated with draining activities.

Without site specific data, it is not possible to estimate the net effect of any particular wetlands in terms of GHG emissions. Moreover, because there is currently no accepted and dependable protocol for making general emissions estimates for wetland areas, the ARB has not included this sector in the statewide emissions inventory. As such, estimates for wetlands in Yolo County were not included in the base-year inventory.

More detail on the available research related to wetlands and GHG emissions is provided in Appendix A.

EMISSION PROJECTIONS

Emission projections estimate future emissions levels and provide insight regarding the scale of reductions necessary to achieve an emissions target or goal. The County has prepared GHG projections within the unincorporated area for 2020, 2030, 2040, and 2050.

The projections are based on population and employment growth forecasts from the Yolo County General Plan. They assume that historical and current energy consumption, transportation, solid waste, and water consumption trends will continue into the future. The projections do not include emission reductions associated with federal and State GHG reduction programs or implementation of the CAP.

The projections were developed using applicable and appropriate indicators for each emissions sector. They were developed for planning purposes, and represent the best-available estimates. Given the complexity of each emissions sector and the unpredictable nature of market conditions, human behavior and demographics, they will likely be revised in the future as more data becomes available. The County will reevaluate the projections throughout the CAP implementation process.

Projected 2020, 2030, 2040, and 2050 communitywide emissions for unincorporated Yolo County are presented in Table 2-1. Due to a lack of jurisdictional control over the stationary-source sector and over the heavy equipment used in the construction and mining sector, these emissions are excluded from the CAP

projections. Examples of permitted stationary-source emissions that are not under the control of the County include equipment and process emissions at manufacturing facilities. These facilities and equipment are permitted by the Yolo-Solano Air Quality Management District, and their GHG emissions would be controlled under the jurisdiction of the Air Resources Board pursuant to AB 32.

In 2020, jurisdictional emissions are anticipated to be about 62% higher than 1990 levels, reaching approximately 993,540 MT CO_2e. In 2030, 2040, and 2050, emissions are anticipated to increase by approximately 127%, 145%, and 162% respectively.

Table 2-1 shows that growth in energy and transportation emissions will contribute to the majority of the increase. New residential and commercial development planned for the Dunnigan Specific Plan area and existing unincorporated communities are key factors in this projected trend.

GREENHOUSE GAS REDUCTION TARGETS AND GOALS

Yolo County has made considerable effort to select emission reduction targets and goals that are both ambitious and practical. Achieving them will contribute to both State and international climate protection efforts. Yolo County seeks to reduce GHG emissions as follows:

- 1990 levels by 2020 (613,651 MT CO_2e/yr)
- 27% below 1990 levels by 2030 (447,965 MT CO_2e/yr)
- 53% below 1990 levels by 2040 (288,416 MT CO_2e/yr)
- 80% below 1990 levels by 2050 (122,730 MT CO_2e/yr)

1990 EMISSIONS LEVEL

A baseline level of emissions is necessary to establish an emissions target and evaluate CAP achievement. Yolo County selected 1990 emissions levels as its baseline in accordance with the AB 32 reduction target (1990 levels by 2020). The County's emissions targets reference this baseline.

The 1990 baseline inventory includes emissions from all activity sectors. Because the County has no jurisdictional control over process emissions from stationary sources or the heavy equipment used in the construction and mining sector, these sectors were removed from the 2020 and future year emissions projections.

The GHG reduction potentials of the CAP measures were summed and subtracted from the projected 2020 and 2030 jurisdictional emissions. The remaining emissions levels were compared with the 1990 baseline to determine if the 2020 target and 2030 goal would be met.

There are approximately 14,855 acres of wetlands in Yolo County, and the pace of wetland creation has occurred at a faster pace than urbanization. Consequently, wetlands are playing an increasing role related to GHG emissions and climate change through carbon sequestration.

TABLE 2-1 UNINCORPORATED COMMUNITYWIDE GREENHOUSE GAS INVENTORY AND PROJECTIONS: 1990 - 2050

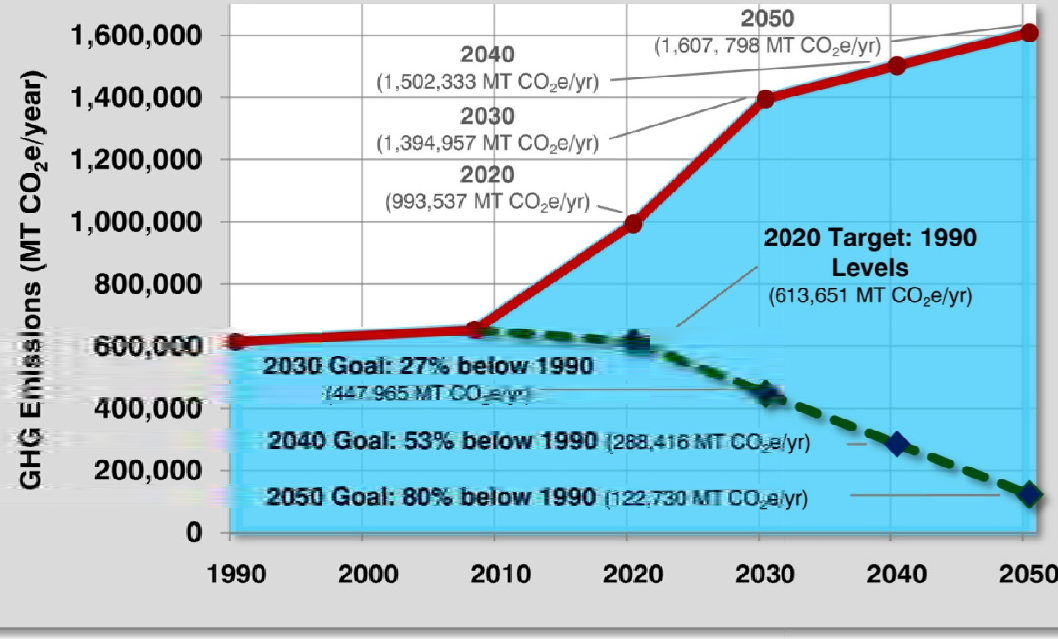
Sector	1990	2008		2020		2030		2040		2050	
	MT CO_2e/yr	MT CO_2e/yr	Change from 1990	MT CO_2e/yr	Change from 1990	MT CO_2e/yr	Change from 1990	MT CO_2e/yr	Change from 1990	MT CO_2e/yr	Change from 1990
Agriculture	292,032	297,341	1.8%	289,482	-0.9%	281,624	-4%	281,624	-4%	281,624	-4%
Transportation	155,577	105,253	-32%	285,492	84%	465,731	199%	510,677	228%	554,733	257%
Energy	131,652	181,447	38%	404,929	208%	628,444	337%	689,093	423%	748,757	469%
Solid Waste	1,654	6,871	316%	12,660	666%	18,449	1,016 %	20,230	1,123 %	21,975	1,229%
Wastewater	256	974	281%	974	281%	709	177%	709	177%	709	177%
Stationary Source (Non-Jurisdictional)	17,526	30,583	75%	Not Included	NA	Not Included	NA	Not Included	NA	Not Included	NA
Mining & Construction (Non-Jurisdictional)	14,954	29,271	96%	Not Included	NA	Not Included	NA	Not Included	NA	Not Included	NA
Total	**613,651**	**651,740**	**6%**	**993,537**	**62%**	**1,394,957**	**127%**	**1,502,332**	**145%**	**1,607,798**	**162%**

Notes: Stationary Source and Mining and Construction sectors are not included in 2020, 2030, 2040, or 2050 jurisdiction emissions projections. Source: Ascent Environmental Inc, 2010

Figure 2-4 illustrates the magnitude of these reductions.

This CAP is designed to address only the mandatory 2020 emission reduction target and the 2030 emission reduction goal, consistent with the timeline of the 2030 General Plan. Yolo County recognizes the 2050 goal (i.e., 80% below 1990 levels) established by the Governor's Executive Order S-03-05 and by Resolution No. 07-109 (the U.S. Cool Counties Climate Stabilization Declaration). However, the General Plan extends only to 2030, which makes projecting 2050 activity and emission levels highly uncertain. As a result, this CAP does not address the steps needed to achieve reduction targets beyond the General Plan horizon year of 2030. The County will regularly reevaluate its long-term GHG reduction goals to reflect future circumstances and adjust emission reduction strategies accordingly.

Figure 2-4: Yolo County GHG Emission Projections and Reduction Targets and Goals



STATEWIDE REDUCTIONS

This CAP assumes that the increase of GHG emissions within the transportation and energy sectors will be reduced through State and federal efforts. These include existing federal regulations addressing GHG emissions from passenger cars and trucks (e.g., Corporate Average Fuel Economy), as well as State regulations requiring increasing amounts of electricity generated from renewable sources (e.g., California Renewable Energy Portfolio Standard Program). These federal and State actions provide important

California State Targets

Executive Order S-3-05
In June 2005, Governor Schwarzenegger signed Executive Order S-3-05. The order establishes targets to reduce statewide GHG emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80% below 1990 levels by 2050.

Assembly Bill 32
In September 2006, Governor Schwarzenegger signed Assembly Bill 32, the California Global Warming Solutions Act of 2006. This law requires California to reduce statewide GHG emissions to 1990 levels by 2020.

Climate Change Scoping Plan
The Climate Change Scoping Plan was approved by the California Air Resources Board (ARB) in 2008, and outlines the State's plan to achieve emission reductions required in AB 32. The plan encourages local jurisdictions to reduce GHG emissions to 1990 levels or 15% below current levels.

reductions that are applied toward the County's 2020 reduction target and 2030 reduction goal. The County will monitor the effectiveness of federal and State legislation to ensure that the anticipated level of reduction is achieved.

2020 Statewide Reductions

The Climate Change Scoping Plan (Scoping Plan) describes the GHG reductions associated with State legislation for each sector of the 2020 emissions inventory. In particular, the following State programs will have a direct effect on the County's GHG emission projections:

- Improved emission standards for light-duty vehicles,
- Enhanced energy efficiency measures in buildings and appliances,
- A renewable electricity standard to increase the use of non-fossil fuels for electricity production, and
- Land use planning and Sustainable Communities Strategies implementing Senate Bill (SB) 375.

Statewide emission reductions anticipated from the Scoping Plan have been applied to the associated emissions sectors in the State's inventory (i.e., transportation and energy use) in order to derive a percent reduction in the applicable County emission sector. Table 2-2 summarizes how emission reductions from these State and federal programs would affect projected emissions within the unincorporated area. If these programs are implemented as described in the Scoping Plan, the County's 2020 emissions will be reduced by a maximum of 12.2% from projected levels, achieving a reduction of approximately 121,212 MT CO_2e/yr in 2020.

Implementation of the State's Climate Change Scoping Plan is expected to reduce the County's 2020 emissions by approximately 12.2% from projected levels.

Table 2-2: Estimated Effects of State and Federal Programs on Unincorporated County GHG Emissions in 2020

Scoping Plan Measure	Affected Emissions Sector	Scoping Plan-Estimated Emission Reduction (MMT CO_2e by 2020)	Projected Statewide 2020 Emissions of Sector (MMT CO_2e by 2020)	% Emission Reduction (Statewide)	% of Yolo County Inventory Affected in 2020	% Emission Reduction from 2020 Projected Emissions (Yolo County)
Federal Fuel Economy Standards; AB 1493 (Pavley)	Transportation	27.7	225.4	12.3%	28.7%	3.5%
Regional Transportation-Related Targets (SB 375)	Transportation	5	225.4	2.2%	28.7%	0.6%
Energy Efficiency Measures; California Green Building Code	Energy	15.2	185.9	8.2%	40.8%	3.3%
Renewable Electricity Standard; Renewable Portfolio Standard	Energy	21.3	185.9	11.5%	40.8%	4.7%
Total						**12.2%**

Table 2-3: GHG Reductions Associated with Implementation of Pavley I in Yolo County in 2030

Weekday CO2 Emission Reduction from Pavley I (tons/day)	Days per Year*	Tons/Metric Ton Conversion	Conversion to CO_2e	GHG Emission Reduction from Pavley I (MT CO_2e/yr)
397.3	347	0.90718474	0.95	131,660

Source: Air Resources *Board Pavley I + Low Carbon Fuel Standard Postprocessor* - Version 1.0
Notes: * The Postprocessor manual states that the weekday emissions values should be multiplied by 347 days per year in order to reflect reduced driving on weekend days.

2030 Statewide Reductions

The Scoping Plan's GHG reduction estimates apply to 2020. The State has not conducted a similar analysis for 2030 or future years. For this reason, the 2020 percent reduction estimates have been used to calculate the anticipated reductions from federal and State programs in 2030. The one exception to this method is use of the ARB *Pavley and LCFS Postprocessor* to estimate the reduction potential of the Federal Fuel Economy Standards and Pavley legislation.

As demonstrated in Table 2-3, implementation of the Pavley-required fuel efficiency standards would reduce GHG emissions by 131,660 MT CO_2e/yr in 2030 (about 9.4% of projected 2030 emissions). Combined, federal and State programs are expected to achieve a reduction of approximately 253,021 MT CO_2e/yr in 2030 (about 18.1% of projected 2030 emissions).

County-led actions described in Chapter 3 are designed to achieve additional emissions reductions to accomplish the County's GHG reduction target and goals as established in the CAP.

State and federal efforts to reduce GHG emissions represent a significant part of the County's strategy. These programs will account for 31.7% of the GHG emission reductions needed to achieve the 2020 County target, and 26.7% of the reductions needed to meet the County 2030 goal. Should the State and federal government not proceed with their plans to reduce truck/vehicle emissions and/or to increase the amount of electricity generated by renewable sources, then future changes may be required to the reduction strategy through the biennial review of the CAP. State law requires that the CAP be amended should the County determine that the adopted 2020 target is not being achieved. As a part of this monitoring process, the implementation of individual measures and overall success toward achieving the 2020 GHG reduction target is to be evaluated and reported on every other year, beginning in 2013.

FIVE STRATEGIES

This chapter defines the strategies and measures to be implemented by Yolo County to achieve its climate protection goals over the next two decades.

The Climate Action Plan (CAP) builds upon Yolo County's strong tradition of stewardship and sustainable planning. The 2030 Countywide General Plan contains numerous policies that provide direction to achieve sustainable development, reduce vehicle emissions, use energy and water more efficiently, reduce waste, and protect and improve agriculture and natural landscapes. The measures and actions within the CAP define the specific steps necessary to implement the General Plan's vision.

The measures and actions also reflect existing greenhouse gas (GHG) reduction programs and activities within the county. The CAP aims to support these successes and, when appropriate, expand upon them.

The measures and actions are grouped into the following five strategies:

Agriculture

Transportation and Land Use

Building Energy

Solid Waste and Wastewater

Adaptation

Agriculture: Agriculture measures aim to reduce GHG emissions associated with nitrogen fertilizer application and the use of fossil fuels in field equipment and irrigation pumping. The agriculture strategy also presents measures and actions to "sequester" or store carbon in agricultural and natural landscapes.

Transportation and Land Use: The transportation and land use measures implement General Plan Land Use and Circulation policies. These measures promote sustainable development patterns and investments in alternative transportation to reduce vehicle travel and associated emissions.

Building Energy: Building energy measures are designed to increase energy and water efficiency in existing buildings, enhance energy and water performance in new construction, and encourage installation of building-scale renewable energy systems. This strategy also proposes a community choice aggregation program that would increase the ability for residents and businesses to purchase low and carbon-free electricity from a variety of energy providers.

Solid Waste and Wastewater: This strategy presents one measure related to the reduction of solid waste emissions. The

measure calls for increasing the efficiency of the methane control system at the County landfill. Supporting measures include increasing or expanding the diversion of organic wastes, and construction and demolition wastes from disposal, as well as increased recycling services in the county.

The strategy also provides supporting measures that address emissions resulting from the treatment and conveyance of sewage and storm water. Methane control systems and low-impact development techniques that treat storm water on-site are the primary approaches.

Adaptation: Adaptation describes how the County plans to address the potential effects of climate change on the existing and planned environment. These measures direct the County to incorporate strategies into existing plans, and to develop new documents where appropriate, to ensure that Yolo County remains responsive to the challenges created by climate change. Specific attention is given to impacts related to agriculture, water resources, sea level rise, wildfires, and public health.

Reduction Measures

The CAP contains 15 primary measures that will help the community achieve GHG reductions and successfully adapt to climate change. To ensure implementation of these measures, specific action steps, performance targets, responsible parties, timeframes, and estimates of emission reduction potential are provided (see page 24 for more detail regarding measure content).

The measures are not meant to be an exhaustive list of all possible ways to reduce GHG emissions and respond to climate change, but are instead a coordinated plan of those actions determined to be most effective and appropriate within the community. These measures were selected based on four criteria: (1) feasibility, (2) emission reduction potential, (3) potential costs and savings, and (4) community co-benefits. These criteria are further described below:

Primary and Supporting Reduction Measures

Primary Measures: The CAP contains 15 primary measures that the County will rely on to achieve GHG reduction and adaptation goals. The CAP defines specific action steps and other performance indicators to help ensure successful implementation of these measures.

Supporting Measures: The CAP also contains 19 supporting measures, which provide important climate protection benefits, but at the time of plan preparation, could not be counted toward reduction targets.

Feasibility – For Yolo County to achieve climate protection goals, recommended measures must be scientifically, economically, and reasonably feasible.

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or about 0.4%
arget and assist

Feasibility was assessed by reviewing measures with stakeholder groups, County staff, university researchers, and other experts.

Emission Reduction Potential – To achieve the County's 2020 and 2030 reduction targets, considerable emission reductions are needed. Throughout the plan's development, the County limited its selection of measures to those expected to provide reliable and significant emission reductions. Rigorous quantification methods were used to analyze each measure's reduction potential (see Appendix D for descriptions of the methods used).

Costs and Savings – Climate protection often costs money in the short term, but can also save money in the long term. Certain measures have the potential to result in long-term savings to government and/or to residents and businesses. The County analyzed the costs and savings for those proposed measures that resulted in the highest potential reductions (see Appendix D for detailed estimates).

Community Co-Benefits – Most CAP measures and actions will do more than reduce emissions. Many also have the potential to deliver numerous combined benefits to the community, including improving air quality and public health, and restoring habitat. The CAP gives additional priority to measures with such co-benefits.

Supporting Measures
While the CAP emphasizes implementation of the primary measures, the County recognizes that other measures may play an important role in the County's overall commitment to climate protection. Supporting measures include those for which (1) GHG reduction potential could not be estimated due to a lack of data, (2) no defensible quantification method existed at the time of plan preparation to calculate the reductions, and/or (3) the emission reductions attributable to the measure do not address emissions contained within the inventory, and thus cannot be counted toward emission reduction targets. Supporting measures are presented within the CAP because they would reduce global emissions, have other

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sures that reduce GHG also have the potential to e community in other

- **prove Air Quality**
- **otect Water Quality**
- **educe Energy Bills**
- **hance Public Health**
- **pport Agriculture**
- **estore Habitat**

important community benefits, and may become primary measures in the future as the science and policy of climate change evolve.

Supporting measures are listed at the end of each strategy. The County will work to further develop these and other measures throughout CAP implementation.

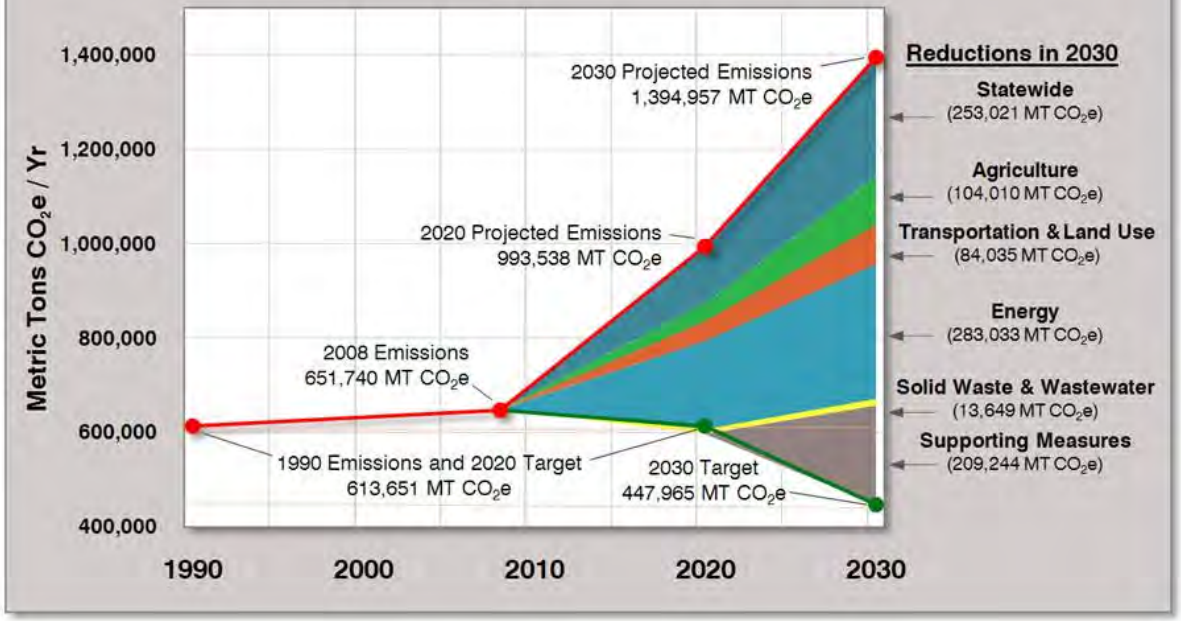
GHG Reduction Potential

Chapter 2 defines a mandatory 2020 reduction target, and 2030, 2040, and 2050 GHG reduction goals for unincorporated Yolo County. The GHG reduction potential of the CAP and its component measures were calculated for the years 2020 and 2030. Estimates of GHG reduction potential in 2020 are important to demonstrate the County's contribution to California's AB 32 climate protection goals. The 2030 target provides a goal for development allowed within the General Plan timeframe. Estimating the GHG reduction potential of the CAP in 2040 and 2050 was not attempted, as such future predictions are speculative, and extend beyond the life of the 2030 General Plan.

2020 Reduction Potential

In 2020, implementation of the primary agriculture, transportation, building energy, and solid waste measures have the potential to reduce GHG emissions by an estimated 261,412 metric tons of carbon dioxide equivalent emissions per year (MT CO_2e/yr). Emission reductions attributed to state and federal legislation have the potential to reduce an additional 121,212 MT CO_2e/yr. Together, State and federal legislation and County actions have the potential to reduce communitywide emissions by about 382,624 MT CO_2e/yr,

Figure 3-1: Climate Action Plan GHG Reductions by Sector



or 0.4% below 1990 emission levels. This level of reduction meets the County's established 2020 target and complies with California's recommended reduction levels for local governments. These reductions do not include anticipated reductions from permanent crops, as accepted sequestration protocols do not yet allow for consideration of carbon storage in permanent crops. However reductions from permanent crops have been quantified in the CAP to provide information about the potential benefits of expanding orchards and/or vineyards. As climate change science continues to emerge, these reductions may be applied in future updates to the CAP.

2030 Reduction Potential

In 2030, the primary CAP measures have the potential to reduce GHG emissions by 484,727 MT CO_2e/yr (See Figure 3-1). The CAP's supporting measures have the potential to reduce an additional 10% to 20% of anticipated 2030 emissions. If these measures achieve a 15% reduction, this would result in an additional 209,244 MT CO_2e/yr. Emission reductions attributed to state and federal legislation have the potential to reduce emissions by an additional 253,021 MT CO_2e/yr. Combined, State and federal legislation, and County actions have the potential to

Table 3-1: GHG Reduction Strategies and Associated Reductions

Strategy	2020	% of Total	2030	% of Total
AGRICULTURE STRATEGY	29,603 MT CO_2e/yr	7.7%	104,010 MT CO_2e/yr	11.0%
TRANSPORTATION AND LAND USE STRATEGY	42,018 MT CO_2e/yr	11.0%	84,035 MT CO_2e/yr	8.9%
BUILDING ENERGY STRATEGY	180,425 MT CO_2e/yr	47.2%	283,033 MT CO_2e/yr	29.9%
SOLID WASTE AND WASTEWATER STRATEGY	9,366 MT CO_2e/yr	2.4%	13,649 MT CO_2e/yr	1.4%
SUPPORTING MEASURES	Not Included in 2020 Target		209,244 MT CO_2e/yr	22.1%
STATE LEVEL REDUCTIONS	121,212 MT CO_2e/yr	31.7%	253,021 MT CO_2e/yr	26.7%
TOTAL GHG REDUCTIONS	**382,624 MT CO_2e/yr**		**946,992 MT CO_2e/yr**	
	0.4% below 1990 levels		**27.0% below 1990 levels**	
TARGET/GOAL	**1990 levels**		**27% below 1990 levels**	

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HG reductions in

reduce communitywide emissions by 946,992 MT CO_2e/yr. This level is 27.0% below 1990 levels, which meets the County's 2030 reduction goal and puts the County on a successful trajectory toward the 2050 goal.

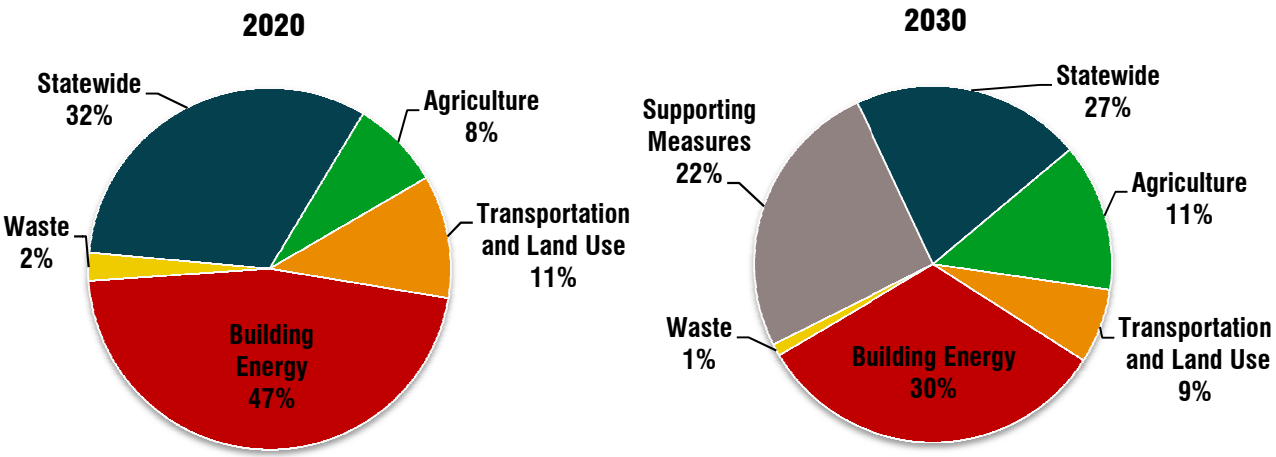
New residential and commercial growth anticipated by the General Plan in the designated Specific Plan Areas (e.g., Dunnigan, Knights Landing, Madison) is the primary challenge for the 2030 goal. However, it is unclear at this time whether the level of assumed growth in Yolo County between 2020 and 2030 will occur. Also, technological improvements are anticipated to provide new and innovative ways to achieve GHG reductions. New methods to quantify emission reductions may be developed to enable Yolo County to take credit for what are currently categorized as supporting measures. Regardless, Yolo County is committed to achieving the 2030 reduction goal through proactive monitoring and reassessment of the CAP's GHG reduction program.

Distribution of GHG Reductions

Table 3-1 and Figure 3-2 demonstrate that measures that address energy conservation and non-fossil fuel sources achieve most of the anticipated reductions in both 2020 (47%) and 2030 (30%). In particular, the Community Choice Aggregation (CCA) program is the single most important measure in the CAP. Among the reduction measures, CCA accounts by itself for 45% of GHG reductions in 2020 and 30% in 2030. If State/federal efforts, as well as stationary sources are included, the percentage of reductions represented by CCA would be 31% for 2020 and 15% for 2030. While the projections anticipate increases in both building energy and transportation emissions, the County has greater ability to reduce emissions related to energy use in buildings.

The smart growth policies contained throughout the General Plan, including the VMT policy in the Circulation Element, are

Figure 3-2: Greenhouse Gas Reductions by Strategy



State and federal actions will provide almost one-third of overall reductions in 2020 more than one-quarter in 2030. Supporting measures provide about 22% of total reductions in 2030.

expected to reduce vehicle emissions and provide approximately 11% of total reductions in 2020 and 9% in 2030.

The third largest source of GHG reductions (approximately 8% in 2020 and 11% in 2030) will occur within the agriculture sector. Measures that reduce use of nitrogen fertilizer, field equipment fuel consumption, and irrigation-related energy use provide the primary reductions. The solid waste measure provides 2% of reductions in 2020 and approximately 1% in 2030 by increasing landfill methane capture within the County landfill.

State and federal actions will provide almost one-third of overall reductions in 2020 and more than one-quarter in 2030. Improving light and medium duty vehicle fuel efficiency, increasing use of lower carbon fuels, and implementing the renewable energy portfolio standard for utility electricity generation will provide most of these statewide reductions.

Supporting measures provide about 22% of total reductions in 2030. As noted earlier, supporting measures are not included in the calculations supporting achievement of the mandatory 2020 target because the GHG reduction potential of these measures has not been verified through existing accepted methods.

Chapter Structure

The remainder of this chapter is structured as follows. A section is devoted to each strategy (e.g., agriculture; transportation; building energy; waste; wastewater; and adaptation). These five strategies represent the primary ways to reduce GHG emissions in unincorporated Yolo County. Each section begins with an introduction to the strategy, including the GHG inventory of the relevant sector and potential reductions. The introduction is followed by discussion of the primary measures that will translate the County's emission reduction and adaptation objectives into on-the-ground implementation. Each section concludes with a list of supporting measures.

Primary GHG Reduction and Adaptation Measures

Primary measures define the programs, policies, and projects that the County will undertake to accomplish its climate protection goals. The discussion of each primary measure contains the following content:

Measure Description

The description provides important background information about the County's intent and policy direction. Additionally, some descriptions provide guidance to be used in implementation.

Action and Progress Indicator Tables

Detailed action steps and progress indicators are provided in a table following each measure description. Actions identify specific steps that the County will take to implement the measure. These tables also identify responsible departments and establish an implementation timeframe for each action. Progress indicators provided in the table will enable staff, the Board of Supervisors, and the public to track implementation and monitor overall progress. The progress indicators represent the level of change necessary to achieve the GHG reduction in the target year.

Greenhouse Gas Reduction Potential

Values within the GHG Reduction Potential column of the measure summary identify the estimated annual emission reductions anticipated in 2020 and 2030, measured in MT CO_2e/yr. Additional information pertaining to the reduction calculations is provided in Appendix B.

Community Co-benefits

Beyond reducing emissions, many measures have the potential to provide other important benefits to the communities that improve the quality of life in Yolo County. These benefits are identified within each measure summary, where applicable.

AGRICULTURE

INTRODUCTION

Farms and ranches cover more than 92% of unincorporated Yolo County, providing communitywide economic and employment benefits. Given the scale of these activities, it is not surprising that agriculture generates almost half of the GHG emissions within the unincorporated area in both the 1990 and 2008 emission inventories. (The inventories do not include emissions from each of the four cities, UC Davis, tribal lands, special districts, and/or federal and State-owned lands. Each of these entities is responsible for adopting their own inventories and climate action plans.)

Within the agricultural sector, nitrous oxide resulting from the application of nitrogen fertilizers contributes more than a third of all farm GHG emissions (See Figure 3-3). Energy consumed by farm equipment and irrigation pumps produces another third of the emissions in this sector. Rice cultivation and livestock generate methane gas and contribute approximately 10% of total GHG emissions each. Crop residue burning and application of lime, urea, and pesticides make up the remainder.

As shown in Figure 3-4, although farming accounts for 87% of the Yolo County land area, it only produced 14% of total countywide GHG emissions in 1990. This raises an important point often overlooked in the climate change debate. Although agriculture contributes a small proportion of overall GHG emissions, it has an unrecognized value that greatly outweighs its minor impact on climate change. The protection of farmland and open space limits the spread of urban development, thereby avoiding uses that create significantly higher levels of GHG emissions.

Urban land accounted for 22,471 acres in Yolo County in 1990. The four cities had total GHG emissions in 1990 of 1,382,444 MT CO_2e, or approximately 61.5 MT CO_2e per acre of urban development. In contrast, intensive (non-livestock) agriculture occurred on 476,483 acres in 1990.

Figure 3-3: Agricultural Greenhouse Gas Emissions by Sub-Sector in 1990

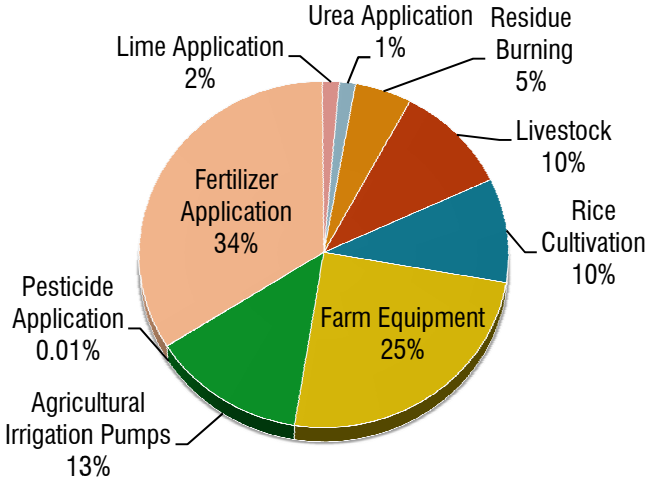
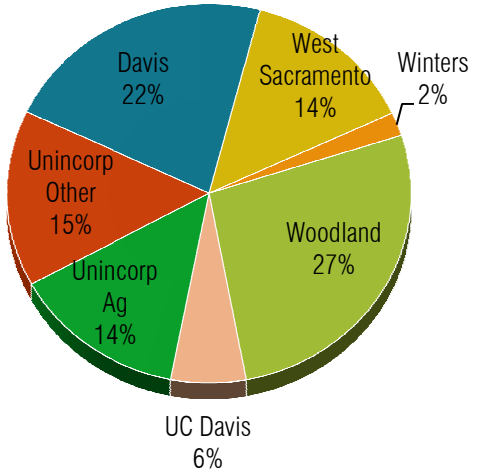


Figure 3-4: Greenhouse Gas Emissions by Jurisdiction in 1990



Excluding livestock, agricultural GHG emissions in 1990 amounted to 262,829 MT CO_2e, or approximately 0.6 MT CO_2e per acre of farmland. Although the calculations used here are very broad, they generally indicate that each acre of agriculture and open space conserved saves nearly 100 times the amount of GHG emissions that would result if the land were converted to urban use.

The CAP includes measures to assist farmers in voluntarily reducing their share of overall emissions; however, the CAP also recognizes the valuable contributions made by farmland and open space in providing a positive alternative to more adverse land use patterns. To that extent, new programs that assist new farmers to acquire land and establish operations, as well as those that help to keep agricultural land affordable for existing farmers (i.e., farm easements) will strengthen the County's ability to manage urban development and prevent higher GHG levels. By emphasizing its agricultural traditions, Yolo County is well poised to provide carbon sequestration and other solutions to offset the emissions of an increasingly urbanized region.

The following pages identify six measures that effectively reduce agricultural emissions. Each of the six primary actions, as well as the six secondary measures, relies on voluntary participation from the farming community through the use of public outreach programs and/or financial incentives. None of these measures place any new mandates on agriculture.

The first measure proposes a technical assistance program to help farmers reduce nitrogen fertilizer inputs. The second measure seeks to increase fuel efficiency in tractors and other farm equipment. The third measure reduces irrigation emissions by encouraging improved pump efficiency and the conversion to solar-powered pumps. These three measures reduce farm operating costs while also reducing emissions.

The fourth measure reduces methane emissions in confined livestock operations. The County will help owners find funding to establish "biogas" control and renewable energy systems. These in turn provide local air quality benefits.
The fifth measure acknowledges international and federal efforts to eliminate the use of methyl bromide, a fumigant pesticide that depletes the Earth's ozone layer.

The final measure addresses carbon sequestration in agricultural and open space landscapes. The County proposes to expand existing riparian reforestation and hedgerow programs. These actions will also advance water quality and habitat protection efforts. The County will also develop a program to identify the sequestration potential of new orchards and other permanent crops.

Measure Description

Using organic or mineral nitrogen fertilizers is essential to maintain soil fertility and provide profitable yields. While these fertilizers are necessary, excessive application generates large amounts of nitrous oxide, a potent GHG. The purpose of this measure is to create a collaborative outreach program to provide information to farmers to allow them to optimize nitrogen application rates, decrease fertilizer input costs, maintain crop yields, and decrease nitrous oxide emissions.

In Yolo County, farmers have successfully reduced nitrogen application rates by 19% since 1990. Farmers identify increased fertilizer costs as the primary motivation behind this trend. Agricultural extension staff and university agronomists believe that additional reductions are possible.

Optimal nitrogen fertilizer application rates vary by crop type. Table 3-2 presents findings from research conducted in Yolo County by University of California - Davis agronomists. Their findings indicate that an additional 25% reduction from current (2008) application rates would minimally affect crop yield for corn, rice, sunflower, and wheat. However, crop yield for tomatoes and safflower would be adversely affected. Similar analyses conducted for orchard crops (e.g., almonds) also found potential for reduced nitrogen input. Crop rotation is also an important factor. For instance, alfalfa can fix nitrogen in the soil that then reduces the need for the next crop in the rotation.

Nitrogen application rates also vary depending on a number of other variables, including timing, source, and irrigation method. Because of the uncertainty involved, historically there has been a tendency to apply more nitrogen than is needed. In other cases, such as alfalfa, nitrogen is applied not as a fertilizer, but as a source of phosphorous.

The County intends for this program to provide a clearinghouse of information that helps farmers voluntarily reduce nitrogen fertilizer application. The program seeks to disseminate knowledge about technologies

Table 3-2: Estimated Effects of a 25% Reduction in Nitrogen Fertilizer Application on Crop Yield and GHG Emissions in the Sacramento Valley by Crop Type

Crop Type	Corn	Rice	Safflower	Sunflower	Tomato	Wheat
Relative Change in Crop Yield (%)	-0.20*	-0.03*	-12.90	-0.04*	-4.00	-0.10*
Change in GHG emissions (MT $C0_2e$/acre/year)	-0.28	-0.38	-0.01*	-0.25	-0.32	-0.06*

Source: De Gryze, Steven, Rosa Catala, Richard E. Howitt, and Johan Six (University of California, Davis). 2008. Assessment of Greenhouse Gas Mitigation in California Agricultural Soils. California Energy Commission, PIER Energy-Related Environmental Research. CEC-500-2008-039.

* Although these figures were cited in the research, they were noted as statistically insignificant.

and best practices, and ensure that future research addresses growers' specific questions and concerns. If successful, the program could create a win-win scenario that improves farm economic efficiency and reduces GHG emissions and non-point source water pollution.

Reducing nitrogen fertilizer application rates can improve farm profits for certain crop types. Fertilizer costs money, and reducing the amount used will lower per-acre production costs. When a reduction in fertilizer application minimally decreases crop yield in some cases, fertilizer cost savings can be greater than the decreased revenue from smaller yield.

Beyond the potential financial and emission reduction benefits, this measure provides air and water quality benefits. In particular, it can also assist growers to contribute to the State's non-point source water pollution efforts.

This measure assumes that farmers will reduce nitrogen fertilizer application by an average of 6% below current (2008) levels by 2020, reducing GHGs by 4,232 MT CO_2e/year. For 2030, the measure assumes that average application rates will be reduced 15% below 2008 levels, which would result in a GHG reduction of 10,294 MT CO_2e/year.

2020 GHG Reduction Potential:

4,132 MT CO_2e (2%)

2030 GHG Reduction Potential:

10,051 MT CO_2e (2%)

Community Co-Benefits:

Reduce Costs
Improve Water Quality
Improve Air Quality
Sustain Agriculture

Applicability:

Agriculture

ACTION		RESPONSIBILITY	TIMEFRAME
A	Work with agricultural organizations to create an outreach program to inform Yolo farmers about ways to reduce nitrogen fertilizer application with minimal effects on crop yield.	Agricultural Commissioner	By June 2011

PROGRESS INDICATORS		TARGET YEAR
A	Average nitrogen fertilizer application rates reduced by 6% below current (2008) levels.	2020
B	Average nitrogen fertilizer application rates reduced by 15% below current (2008) levels.	2030

Measure Description

Farms use a considerable amount of fossil fuel within their field operations. Routine maintenance and more efficient equipment operation can provide valuable fuel savings. Engine and equipment upgrades are also expected to increase fuel efficiency. The County, in association with agricultural organizations, will provide outreach to improve on-farm fuel efficiency.

Ensuring that farm equipment is in top operating condition will save fuel and money, help reduce repair costs, improve equipment reliability, and reduce harmful exhaust emissions. Efficient field operation practices such as optimizing drawbar load can save a substantial amount of fuel. This measure assumes that improvements will reduce fuel consumption in 5% of all field equipment by 6%. This will reduce emissions by 221 MT CO_2e/year in 2020 and by 215 MT CO_2e/year in 2030.

The program will also encourage farmers to upgrade tractors and engines and participate in the Air Resource Board's Carl Moyer program that provides incentive grants for cleaner-than-required engines. These upgrades are anticipated to occur in 25% of tractors by 2020 and 75% of tractors by 2030, resulting in 921 MT CO_2e/year and 2,688 MT CO_2e/year respectively.

2020 GHG Reduction Potential:
1,142 MT CO_2e (<1%)

2030 GHG Reduction Potential:
2,903 MT CO_2e (1%)

Community Co-Benefits:
Save Money
Improve Air Quality

Applicability:
Agricultural Field Equipment

ACTION		RESPONSIBILITY	TIMEFRAME
A	Work with agricultural organizations to provide workshops/presentations and outreach materials focused on promoting fuel efficient farm equipment and operations and encourage participation in the California Air Resources Board's Carl Moyer incentive program.	Agricultural Commissioner	By June 2011

PROGRESS INDICATORS		TARGET YEAR
A	Fuel efficiency improved by 6% in 5% of farm equipment through operation and maintenance improvements.	2030
B	Fuel efficiency improved by 5% in 25% of farm equipment through improvements to equipment (e,g., conversion to Tier IV engines or better).	2020
C	Fuel efficiency improved by 5% in 75% of farm equipment through improvements to equipment (e,g., conversion to Tier IV engines or better).	2030

Measure Description

In Yolo County, diesel, natural gas, and electric irrigation pumps are used to pump groundwater from agricultural wells and to return irrigation tail water for reuse in fields. This measure proposes two programs to reduce irrigation emissions:

Solar Irrigation Return Pumps:
As the cost of photovoltaic panels continues to decline, more farmers are switching to solar-powered irrigation pumps. In Yolo County, farmers tend to use this technology to power tail water-return pumps, which are often lower in horsepower (less than 10 horsepower) and located far from utility connections. Photovoltaic panels are intended to supplement existing power sources, as pumping generally occurs 24-hours a day and solar energy is only available during daylight hours. Grants, financing, and other incentives would likely be needed to make this voluntary program successful. To encourage the expansion of this shift, the County will waive associated permit fees. This measure is expected to reduce agricultural emissions by approximately 16,130 MT CO_2e/year in 2020 and 35,308 MT CO_2e/year in 2030.

Pump Bowl Efficiency:
Routine repairs to pump bowl components can decrease pump energy use by one-third. The County will partner with agricultural organizations to develop an outreach and incentive program to encourage these repairs. The measure is expected to reduce agricultural emissions by approximately 1,331 MT CO_2e/year in 2020 and 1,295 MT CO_2e/year in 2030.

2020 GHG Reduction Potential:
9,396 MT CO_2e (4%)

2030 GHG Reduction Potential:
18,949 MT CO_2e (4%)

Community Co-Benefits:
Improve Air Quality
Reduce Energy Bills

Applicability:
Agricultural Irrigation

ACTION		RESPONSIBILITY	TIMEFRAME
A	Waive County permit fees for projects that convert tailwater-return pumps to solar power.	Planning and Public Works Department	2011
B	Work with agricultural organizations (e.g., Center for Irrigation Technology at CSU Fresno) and Yolo Energy Watch to develop an outreach and incentives program to encourage farmers to improve the efficiency of irrigation pumps.	Agricultural Commissioner	2011

PROGRESS INDICATORS		TARGET YEAR
A	40% of tailwater-return pumps switched to solar electric energy source providing 50% of pumping energy.	2020
B	90% of tailwater- return pumps switched to solar electric energy source providing 50% of pumping energy.	2030
C	10% of groundwater pumps improve pump bowl efficiency for an average 33% reduction in energy (electricity or diesel) consumed.	2020 & 2030

S

Measure Description

Conventional manure management in confined livestock operations (e.g., dairies and feedlots) generates large amounts of methane, a potent greenhouse gas. Installing a biogas control system (BCS) to capture and destroy methane gas from manure treatment reduces GHG emissions and provides the opportunity for renewable electricity generation. A variety of BCS technologies exist including open flaring, electricity generation, and thermal energy production.

According to US Department of Agriculture research, dairy operations generally require a minimum of 300-500 head to produce electricity with a biogas system at a profit. Of the large confined livestock operations in California that have opted to collect biogas, almost all have used the collected biogas to generate electricity and thermal energy for use onsite or to sell to the grid. The installation of a biogas system on the one dairy currently located in the unincorporated area would exceed the greenhouse gas reduction potential of increasing methane capture to 90 percent at the Yolo County Central Landfill. However, due to the high initial cost of installing such systems, only one percent of dairies statewide have biogas collectors. Given the impact of the current recession on the dairy industry in California, significant grant funding and support will be needed to assist the dairy operation, should the operator choose to voluntarily participate in developing a biogas system.

The Climate Action Registry has developed a report titled *Livestock Project Protocol*, which provides guidance to calculate, report, and verify emission reductions associated with installing a BCS. Projects that fulfill protocol requirements are eligible to trade the emissions reductions associated with methane reduction and renewable energy generation on existing carbon markets. Revenues earned from this could help offset BCS development costs. The County will assist operators in identifying funding sources to support BCS development.

2020 GHG Reduction Potential:
12,370 MT CO_2e (5%)

2030 GHG Reduction Potential:
12,035 MT CO_2e (2%)

Community Co-Benefits:
Improve Air Quality
Improve Water Quality

Applicability:
Existing and New
Confined Livestock Operations

ACTION		RESPONSIBILITY	TIMEFRAME
A	Work with confined livestock operators to identify potential funding assistance for the implementation of methane biogas control systems and related renewable energy generation systems.	Agricultural Commissioner	By June 2011

PROGRESS INDICATORS		TARGET YEAR
A	Reduction of 90% manure methane emissions from 100% of confined livestock operations.	2020 & 2030

Measure Description

Methyl bromide is a pesticide used to treat nematode infestations in stone fruit orchards and strawberry fields, and to treat post-harvest facilities for commodities such as walnuts, grapes, raisins, and cherries. Commodities are often treated with the fumigant as part of a quarantine or import requirements of an importing country. In 2005, over 15,000 pounds of the fumigant were used within the county, resulting in 36 MT CO_2e of GHG emissions.

In accordance with the Montreal Protocol, the U.S. government is in the process of phasing out methyl bromide due to its negative impacts on the ozone layer. The Protocol called for 100% elimination of the pesticide by 2005 except for critical use exemptions. However, the State of California has been granted a critical use exemption for various agricultural uses for every year after 2005. While the State continues to request these exemptions, this measure assumes that use of the pesticide will be eliminated by 2020 when viable alternatives are expected to exist.

2020 GHG Reduction Potential:
36 MT CO_2e (<1%)

2030 GHG Reduction Potential:
36 MT CO_2e (<1%)

Community Co-Benefits:
Improve Air Quality
Improve Water Quality

Applicability:
Orchards and Post-Harvest Processing Facilities

ACTION		RESPONSIBILITY	TIMEFRAME
A	International phase-out expected to eliminate methyl bromide use by 2020.	N/A	2020

PROGRESS INDICATORS		TARGET YEAR
A	100% reduction in methyl bromide application	2020 / 2030

MEASURE A-6:
Sequester carbon in agricultural landscapes

Measure Description

Carbon sequestration refers to the accumulation of atmospheric carbon within the biomass of plants and soils. Agricultural and open space landscapes in Yolo County offer considerable potential for carbon sequestration. While other measures in the CAP focus on reducing GHG emissions, this measure aims to offset the community's emissions through the restoration of riparian forests, establishment of hedgerows, and planting of additional permanent orchards.

Riparian Forest Restoration

Historically, riparian forests existed along most waterways in Yolo County. These forests were cleared to make way for agriculture, cities, and other uses. Today, approximately 2,000 acres in Yolo County could be restored to riparian forest. The U.S. Forest Service's Carbon Online Calculator estimates that a mature riparian forest in California sequesters approximately 112 MT CO_2 per acre. Over a 100-year growth period, the annual sequestration rate can be expected to be approximately 0.46 MT CO_2 per acre per year.

The County will develop a program to allow developers to restore riparian forests to offset all or a portion of the GHG emissions related to a particular development. The forests would be required to be in locations that are found by a qualified biologist to be either consistent with or complementary to the Yolo Natural Heritage Program, and protected in perpetuity through conservation easements. It is estimated that this program and other sources will enable 1,100 acres to be restored by 2020, and 2,000 acres to be restored by 2030. This level of reforestation is expected to provide a reduction of 2,203 MT CO_2e/year and 4,006 MT CO_2e/year respectively.

On-Farm Conservation Practices

Since the mid-1990's, the Yolo County Resource Conservation District (RCD), in cooperation with the United States Department of Agriculture's (USDA) Natural Resource Conservation Service (NRCS), has helped farmers develop hedgerows, enhance sloughs, vegetate drainage ditches, and establish filter strips to create habitat for beneficial insect species, improve crop pollination, improve water quality, and reduce soil erosion. (See the RCD list of practices at http://www.yolorcd.org/nodes/resource/landowner_practices.htm).

Hedgerows consist of linear strips of native grasses, shrubs, and trees planted on field edges. RCD estimates that they establish 5 miles (or 7.6 acres) of new hedgerows annually throughout the county. Slough enhancement, consisting of vegetated drainage ditches and filter strips, are similar in many respects to hedgerows. It involves the planting of deep-rooted native grasses, sedges and rushes, trees, shrubs, and forbs along the edge of sloughs, ditches, and fields.

A recent UC Davis study of the carbon sequestration potential of agricultural landscapes found that a 15-year old hedgerow sequesters approximately 8 MT CO_2 per acre. This equates to a rate of 0.51 MT CO_2 per acre per year. It is expected that on-farm conservation practices, given that they employ the same plant palates, would provide similar sequestration rates.

Between 2011 and 2020, RCD's program is expected to establish 175 acres of hedgerow sequestering 324 MT CO_2/year. By 2030, a total of 380 acres will be established, sequestering 704 MT CO_2/year. The County will create a program that would allow developers to pay fees to have RCD establish additional conservation practices, depending on the location and landowner interest. This mix of practices could be used to offset all or a portion of the development's emissions.

Permanent Crops
According to the County Agricultural Commissioner, Yolo County is experiencing a trend away from annual field crops and toward permanent crops (e.g., orchards). The County Annual Crop Reports show that orchards and vineyards accounted for 19,528 acres in 1990. By 2008, that number had nearly doubled to 36,008 acres. For this measure, the County assumes that this trend will continue. The CAP assumes that an increase of 1,146 acres of almonds, 891 acres of walnuts, and 2,860 acres of olives will occur over the next 20 years.

It is estimated that these trees will sequester 17,600 MT CO2/year in 2020 and 55,568 MT CO2/year in 2030. At the time of plan preparation, no carbon sequestration protocol exists for permanent crops. As a result, the estimates are not credited toward the 2020 emissions reduction target.

Crop Roots
As with permanent crops, there is no accepted protocol that would currently allow the CAP to apply sequestration credits from crop roots transferring carbon from the atmosphere into sub surface soil toward the 2020 target.

As the science develops and accepted protocols include carbon storage in permanent crops and crop roots, the County expects this type of sequestration to be applied toward future targets. As a result, permanent crops are credited toward the 2030 reduction goal.

Oak Woodlands
Existing oak trees are already accounted for in the 2008 GHG inventory. The preservation of existing oak trees does not create any additional emission reductions; it only maintains the current baseline condition. As a result, any permanent easements to protect existing oak trees would double-count the level of carbon sequestration that already exists. However, if a land owner were to plant and maintain new oak trees, they would create additional savings in greenhouse gas emissions that could receive carbon credits.

Carbon Sequestration Considerations
How long carbon will be stored in a landscape is a key consideration. Unlike most other reductions in GHG emissions, which once achieved become permanent, carbon sequestration benefits can be reversed at any point in the future. For example, forests or orchards can be cut down and removed. The County will work to ensure that the issue of permanence is addressed within proposed sequestration programs and when monitoring CAP effectiveness.

2020 GHG Reduction Potential:
2,527 MT CO_2e (1%)
(does not include permanent crops)

2030 GHG Reduction Potential:
60,033 MT CO_2e (12%)
(includes permanent crops)

Community Co-Benefits:
Restore Habitat
Improve Water Quality

Applicability:
Agriculture, Open Space
New Development

ACTION		RESPONSIBILITY	TIMEFRAME
A	Create a program to allow developers to restore riparian forest and/or oak woodlands in locations consistent with or that complement the Yolo Natural Heritage Program to offset all or a portion of the development's expected emissions.	Agricultural Commissioner, Planning and Public Works	By June 2011
B	Create a program to allow developers to pay fees that would assist the Resource Conservation District (RCD) to implement its on-farm conservation practices program. The net GHG savings from such projects would be used to offset all or a portion of the development's expected emissions.	Agricultural Commissioner, Planning and Public Works	By June 2011
C	Develop a system for tracking the establishment of new orchards in the County, using the GIS data provided by the Agricultural Commissioner.	Agricultural Commissioner, Planning and Public Works	By June 2011

PROGRESS INDICATORS		TARGET YEAR
A	1,100 acres of riparian forest restored by 2020. 2,000 acres restored by 2030.	2020 / 2030
B	50 miles of new hedgerow established by 2020 and 100 miles established by 2030.	2020 / 2030
C	New orchards established by 2020 (537 acres almonds, 446 acres walnuts, 1,340 acres olives). New orchards established by 2030 (1,146 acres almonds, 891 acres walnuts, 2,860 acres olives).	2020 2030

The County also considered the following supporting measures as part of the Agriculture Strategy. The County will continue to monitor the feasibility of these measures, and may employ one or more of these measures to achieve the 2030 GHG reduction goal.

Increase Use of Biofuels or Low-Carbon Fuels in Field Equipment

Replacing conventional gasoline and diesel with biofuels (e.g., biodiesel, ethanol) or low-carbon fossil fuel alternatives, has the potential to reduce GHG emissions associated with field equipment operation.

California's Low Carbon Fuel Standard law requires changes to the types of fuels used in vehicles. While the legislation's primary focus is automobiles and trucks, future changes to fossil fuel composition and a greater availability of biofuels will help reduce field equipment emissions as well.

The County will promote the use of such fuels through the support of biofuel co-operatives and by working with current agricultural fuel suppliers to increase the availability of biofuels in the region.

While the use of biofuels may provide GHG reductions benefits it is important to consider the lifecycle effects associated with each fuel type. A recent Air Resource Board study found that the manufacture of corn-based ethanol produces twice the GHG emissions of gasoline for every mile driven (ARB 2009). Additionally, the County will not support the use of biofuels that create secondary impacts such as rainforest habitat destruction or global food price increases.

Conservation Tillage

In conservation tillage systems, crops are grown with minimal cultivation of the soil. This practice can result in less fuel use. According to the National Sustainable Agriculture Information Service, no-till methods can cut tractor use by half, and reduce fuel costs by as much as $10 per acre compared to traditional tillage.

In traditional tillage systems, a farmer will plow, disk, and cultivate before and after planting. Conservation tillage minimizes these operations by either eliminating seedbed preparation, or by combining it with other field operations like planting. Potential trade-offs include a possible increase in the amount of herbicides and fertilizer.

An additional benefit of conservation tillage is that it results in increased soil carbon storage. Farmland converted from traditional tillage to conservation tillage could aid the county's carbon sequestration efforts. Research indicates that conservation tillage can, however, result in increased nitrous oxide emissions because minimally tilled soils have lower levels of soil aeration and higher de-nitrification rates than conventionally tilled soils (Rochette 2008). These increased N_2O emissions may be large enough to cancel out the carbon storage benefits.

Regardless of whether conservation tillage benefits climate change, market forces are already resulting in greater use of these practices. Over the past several years, as the popularity of organic and "green"

products has grown among consumers, retail companies and other large buyers of farm produce have increasingly required growers to carry out sustainable farm practices, such as conservation tillage. The retailers are then able to incorporate growers' practices into the advertising of the products.
The County will continue to evaluate conservation tillage as a potential source of GHG reductions.

Reduce Methane Emissions from Manure Management in Horse Facilities

Livestock biogas control systems (BCS) are primarily used in dairies and cattle feedlots. Similar systems could be applied to stables to reduce horse manure methane emissions. The County will explore the technical and economic feasibility of utilizing BCS in this manner in future updates to the CAP.

Increase Consumption and Production of Local Agricultural Products

Increasing the consumption and production of local agricultural products improves the local economy and can reduce food-related GHG emissions. Yolo County farms and ranches produce a tremendous variety of products. While many residents, restaurants, and institutions have access to these products through existing markets, the County would like to further facilitate this consumption by establishing local product marketing efforts, expanding the number of businesses and agencies that use local food, and increasing opportunities for the direct sale of local food.

In addition, local production of agricultural products can also reduce the emissions associated with transport. In recent years, a tomato seedling company has relocated from the Stockton area to Yolo County, significantly shortening the distance they would have otherwise been hauled to local fields for planning. Similarly, the Bogle Winery currently under construction will greatly expand the capacity of local processing facilities, eliminating the need to send grapes to Lodi for crushing, as well as the return trip to bring the juice back to the winery for fermentation. Another example is a proposed olive mill located in the Capay Valley, which will avoid truck trips to Corning for processing.

In both cases, the County will work with established agricultural organizations to expand "Buy Local" campaigns that target households, businesses, and civic groups in Yolo County; and to find locations and/or provide financing to address infrastructure needs. The County will also work with farmers' market associations to identify potential locations for new markets, and/or expansion of existing markets, as well as to facilitate permitting for new processing facilities.

Reduce Agricultural Water Use Through Alternative Irrigation Techniques

As discussed in Measure A-3, pumping groundwater for irrigation generates GHG emissions. Increasing the efficiency of the amount of water used in groundwater-irrigated farmland through application of alternate-furrow, drip, and deficit irrigation could reduce these emissions.

Applications of alternate-furrow and drip irrigation in Yolo County have successfully improved yields in a variety of crops without using more water. However, drip irrigation can require additional pressurization and plastic drip tape. These factors should be considered when evaluating GHG reduction potential.

Deficit irrigation optimizes water application by irrigating crops during their drought-sensitive growth stages and limiting water during other stages. In addition to reducing water consumption, the strategy can improve fruit quality and control of disease and pests.

With UC Extension, the Flood Control and Water Conservation District, Reclamation Districts, water districts, and farming organizations, the County will develop an outreach program that encourages adoption of irrigation best practices including these three strategies.

Recent research indicates that alternate-furrow, drip irrigation, and deficit irrigation can increase soil aeration and reduce nitrous oxide emissions. As this research evolves, the County will consult with extensions and UC Davis researchers to evaluate potential ways to quantify the associated GHG reduction benefits.

Expand Surface Irrigation Infrastructure

Another way to reduce groundwater pumping-related emissions is to expand surface irrigation to additional acreage in County. Groundwater is used almost exclusively in areas of the County not served by irrigation canals. The County will work with the Flood Management and Water District to examine the potential to expand the acreage served by surface irrigation storage and/or infrastructure.

Expand Use of Bioengineered Crops

Engineered crops have the potential to significantly reduce agricultural GHG emissions. For instance, the use of crops developed to be resistant to glyphosphate has greatly decreased both the amount of tillage and nitrogen fertilizer applied. They also require less spraying than conventional varieties, which reduces the emissions associated with farm equipment. If this trait can be incorporated more

broadly, it would further reduce the use of nitrogen fertilizer.

Yolo County is currently home to a large concentration of bioengineering firms and will continue to work with the industry to facilitate the establishment and expansion of their operations.


Lorrie Jo Williams

INTRODUCTION

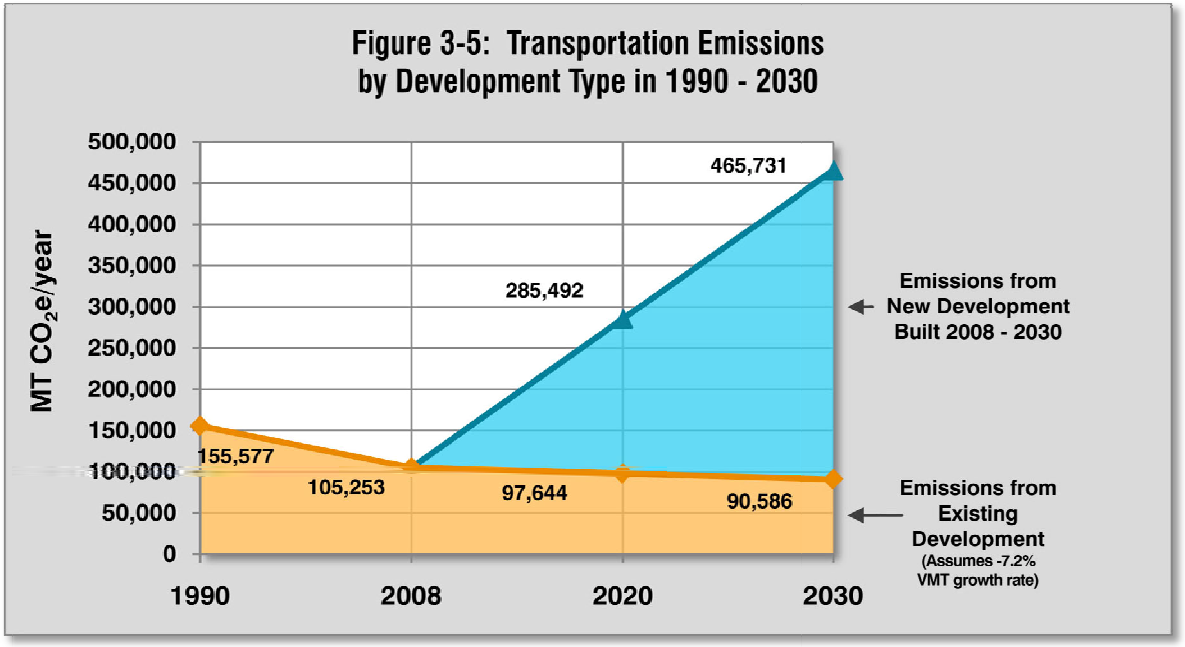
The 2020 and 2030 GHG projections estimate that transportation emissions in the unincorporated area will increase considerably in the next two decades. Minimizing these emissions will be essential to achieve the County's climate protection and air quality goals.

The Land Use and Circulation elements of the 2030 General Plan contain numerous policies that outline the County's vision for smart growth development patterns and a balanced transportation system. The intent of these policies is to provide residents with multiple travel choices and minimize environmental impacts, including transportation emissions. This section of the CAP reiterates these important policies and programs and quantifies their emission reduction potential. The CAP does not propose additional measures.

Transportation Emissions Growth

As described earlier in this Chapter, new planned development in unincorporated Yolo County is projected to result in increases in transportation and building-related energy emissions. Figure 3-5 demonstrates the role that new development will play in increasing vehicle emissions. Without County action, projected residential and commercial development would generate 2.6 times more vehicle emissions in 2020 than existing (2008) development. By 2030, this would increase to 4.2 times more. The County recognizes that to meet GHG emission reduction goals, it must take considerable actions to minimize transportation emissions in new development.

Figure 3-5: Transportation Emissions by Development Type in 1990 - 2030




DO NOT PASS

Transportation research demonstrates that smart growth land use patterns and pedestrian-oriented urban design can substantially reduce residents' need to use automobiles. This reduces household travel costs, road congestion, and air pollution.

Four Reduction Methods

Transportation planners often refer to four fundamental ways to reduce transportation-related GHG emissions:

- increasing vehicle fuel efficiency;
- reducing the carbon content of vehicle fuels;
- reducing the number of vehicle miles traveled (VMT); and
- optimizes vehicle operations and driver behavior, including strategies such as speed management, eco-driving, and vehicle maintenance.

The way land uses are arranged in a community, the availability of local employment, and the extent and quality of alternative transportation infrastructure (e.g., bicycle, pedestrian, transit) influences how far and by what means people travel. Land use patterns and transportation can be designed in such a way as to substantially reduce VMT generated at the household and community level.

While federal and State legislation and regulations address vehicle fuel efficiency and the carbon content of fuels on a broad level, Yolo County's actions will determine the success of the latter two methods, and will play a critical role in achieving VMT reductions.

Federal and State Actions

The federal government and State of California have taken various actions that will increase vehicle efficiency and reduce the carbon content of vehicle fuels. The federal Corporate Average Fuel Economy (CAFE) standards were recently increased to require higher fuel efficiency in passenger vehicles and light duty trucks. In 2016, cars will need to achieve a fuel economy of 37.8 miles per gallon and trucks will need to achieve 28.8. California's Low Carbon Fuel Standard will result in an additional 10% reduction by lowering the carbon content of traditional fuels (e.g., gasoline and diesel) and by advancing alternative vehicle energy systems such as plug-in electric, fuel cell, and other technologies. In addition to these technology-based efforts, SB 375 aims to reduce VMT and associated emissions by influencing local and regional transportation, land use, and housing policies. In the Sacramento region, the SB 375 VMT reduction goal is 16% per capita by 2035. SACOG and its member jurisdictions are responsible for implementing policies and programs to achieve this target. The CAP includes measures that achieve a 23% reduction in VMT within the Specific Plan areas, which significantly exceeds the SB 375 goal.

County Actions

As described earlier in this chapter, the County has already taken several significant steps towards addressing the issue of climate change. While federal and state actions will reduce emissions considerably in the future, the County will have to take additional action to achieve proposed target reductions.

Yolo County General Plan Policies

The Yolo County General Plan contains policies that will direct future land use and transportation decisions and will reduce GHG emissions, improve air quality, and enhance community quality of life and mobility. These policies focus on both new growth in the Dunnigan Specific Plan area

and on infill and redevelopment opportunities in existing communities.

The Dunnigan Specific Plan area is expected to accommodate a large portion of the County's planned growth and represents an excellent opportunity to reduce future transportation-related GHG emissions. General Plan Policy CI-3.19 requires development in the Dunnigan Specific Plan area to achieve a performance standard of 44 vehicle miles travelled per household per day, or approximately the same level of household vehicle travel found within the cities of Woodland and Davis.

Development in the Specific Plan area will achieve most of the required VMT reductions through appropriate use of land use patterns, urban design, and alternative transportation investments, but transportation demand management programs (e.g., transit subsidies) will also be necessary. New development must demonstrate that it will achieve this requirement, and must monitor compliance with the performance standard over time.

Policies contained in the General Plan Land Use and Circulation Elements related to smart growth and VMT thresholds have the potential to reduce 42,018 MT CO_2e/yr in 2020 and 84,035 MT CO_2e/yr in 2030. Federal and State policies will contribute a similar level of reduction.


Erika Kali

While more limited than in the Dunnigan Specific Plan, potential also exists to reduce transportation-related emissions in existing unincorporated communities. General Plan Policy CI-3.21 directs new growth in existing communities to reduce VMT to the extent feasible. Infill development located in these communities will allow future residents increased access to amenities and economic development opportunities.

Providing new services, shops, and recreational opportunities within established neighborhoods will further reduce emissions.

Other General Plan land use and transportation policies support these VMT reduction goals. The intent of these measures is summarized below. A comprehensive list of General Plan policies and actions to reduce transportation emissions is provided in Appendix F.

Land Use

Smart growth land use patterns and urban design can considerably reduce the number and length of vehicle trips a household makes per day. These qualities can also increase the likelihood that residents will use alternative travel modes. The General Plan directs future growth to incorporate the following concepts to establish lower VMT development and reduce GHG emissions:

Mixed Uses –The degree to which residential, commercial, industrial, institutional, and recreational uses are located in close proximity influences how far people need to travel to work, shop, or recreate. A key measure of this is a community's jobs/housing relationship. The General Plan requires that jobs and housing be balanced (equal numbers of jobs and dwelling units); matched (salaries matched to housing prices), and phased (production of jobs keeping pace with production of housing) within each community to reduce the need for long commutes. Additionally, the General Plan land use map directs the location of future uses to ensure an appropriate level of diversity, a mix of land uses, and proximity of recreation and services.

Compact Development – While allowing for a diversity of home types and lot sizes, the General Plan requires growth within Specific Plan residential areas to develop at a minimum community-wide average of 8 homes per acre. This is much higher than the density of unincorporated communities (at about 4 homes per acre) or the cities within Yolo County (which range from 2.5 to 9 homes per acre). Moderate to high densities increase the viability of services, shops, schools, and public buildings located within a neighborhood and increase the availability of transit and pedestrian infrastructure. These conditions reduce the need for vehicle trips and increase the use of alternative modes.

Use of Existing Assets – Communities with vibrant mixed-use centers tend to generate fewer transportation-related emissions than communities without these centers. The General Plan directs new development to establish downtowns and reinvigorate existing community centers through infill development. Growth boundaries are established around each unincorporated neighborhood and/or community, while infill development is prioritized.

Natural Resources Conservation – Permanent green belts would be established between cities and communities, which ensure that agriculture is not converted to urban uses which result in higher levels of GHGs. They also provide areas for orchards, vineyards, and other permanent crops which can increase carbon sequestration. Similarly, open space protection allows for the expansion of hedgerows and riparian vegetation, and the preservation of existing oak forests.

Housing Choice and Diversity – By providing a wide range of housing types, each town can accommodate the full range of households that make up a community. Over the past several decades, there has been a tendency for new families to live in the suburbs, while their parents live in older inner city areas. A diverse housing inventory creates opportunities for a variety of people to live within the same town, including families, singles, seniors, and people with special needs. It also allows very low-, low-, and moderate-income households to live close to work, rather than commuting in from outlying areas where housing costs are lower.

Quality Design – "Green" construction and design can result in significant energy savings and reduced resources, which in turn lowers greenhouse gas emissions. Features required by the General Plan include recycled building materials, drought tolerant landscaping, water efficient fixtures, Energy Star appliances, passive and active solar technology, grey water use for landscaping, and increased insulation and heating/cooling efficiencies. In addition, the Yolo County Design Guidelines provide specific directions for development, requiring new projects to incorporate environmentally-sensitive site planning; the innovative use of materials to conserve resources; and green building techniques.

Transportation

The extent and quality of pedestrian, bicycle, transit, and rideshare infrastructure and programs have a strong influence over

People use public transit when it is accessible, high quality, and provides access to desired destinations.

whether people choose to drive or use alternative transportation modes. The General Plan directs the following design features and infrastructure standards:

Smart Growth - The General Plan includes policies that encourage existing unincorporated towns to develop in a sustainable manner, with housing, jobs, and services similar to those in established communities. By creating full-service communities designed around sustainable principles, the General Plan will reduce both the number of daily VMT by each household and GHG emissions. These reductions will occur not just for new growth but for existing development as well, as neighborhoods benefit from infill, mixed uses, and higher densities.

Circulation Network – The design of streets and related infrastructure dictates whether residents consider it safe and convenient to walk or bike in their communities. The Circulation Element promotes the "complete streets" concept by establishing requirements for future transportation infrastructure, including a 600-foot maximum block length, narrow streets with adequate tree shade, separated sidewalks, convenient and secure bicycle parking, and avoidance of cul-de-sacs and other pedestrian and bicycle barriers.

The Plan also requires street design features that increase traffic flow and reduce idling emissions, such as roundabouts and synchronized signals.

Transit Choices – People use public transit when it is accessible, high quality, and provides access to desired destinations. The General Plan directs public transit investments to create attractive alternatives to single-occupant motor vehicles. Specific policies direct transit stops and hubs to be located in convenient locations, provide appropriate amenities, feature direct access to bike and pedestrian networks, require the preparation of transit plans to expand existing bus service, and allow for potential commuter rail access where feasible.

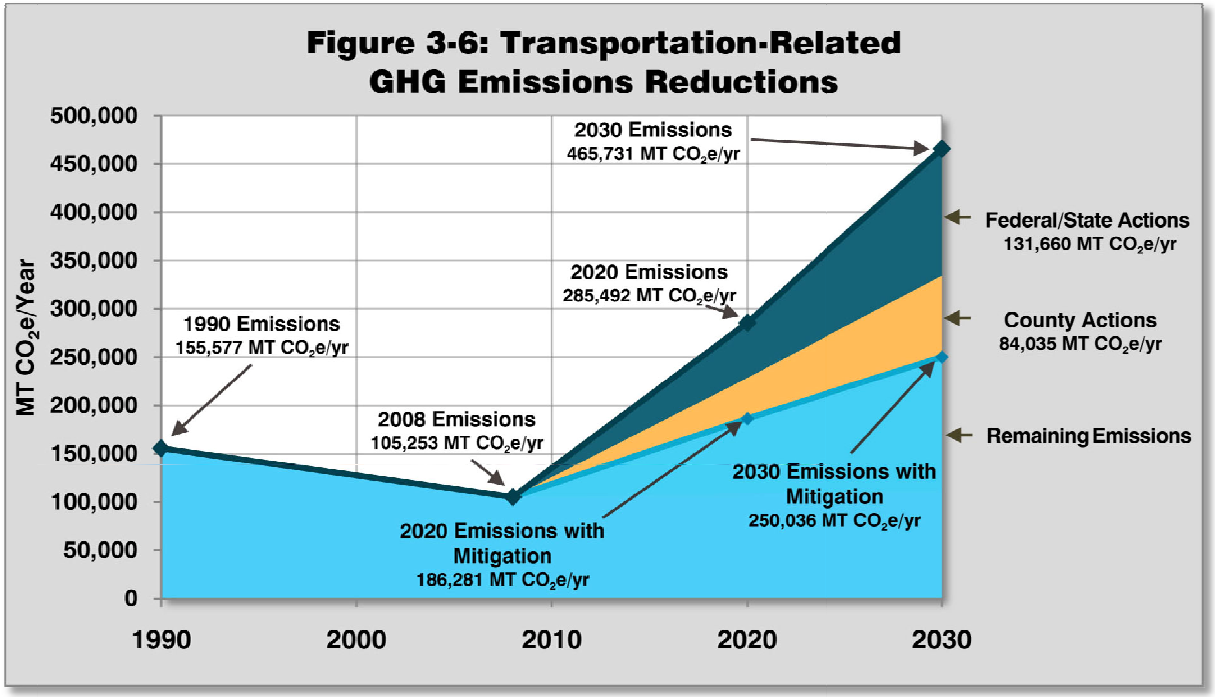
VMT Maximum Threshold – By employing each of the above strategies, as well as other policies, the General Plan will reduce the average household weekday VMT in rural areas from 83 miles in 2005 to at least 77 miles. Actual reductions may be lower, depending on the implementation of smart growth policies within the communities. More importantly, the General Plan requires growth within the Dunnigan Specific Plan area to be designed such that the average household weekday VMT is only 44 miles. The same maximum threshold of 44 miles is set as a goal for the design of other Specific Plan areas (e.g., Madison, Knights Landing, Elkhorn, and Covell).

GHG Reduction Estimates

Figure 3-6 represents the overall reduction in vehicle emissions in 2020 and 2030 and the individual contributions of federal, State and County actions. In 2020, federal and State actions are expected to reduce transportation emissions by 40,375 MT CO_2e/yr. By 2030, federal and State action could reduce 131,660 MT CO_2e/yr. It should be noted that these estimates only reflect implementation of existing policy. The federal and State governments are likely to enact additional regulations. The County will evaluate the reduction potential of these actions at that time.

The County's adopted policies have the potential to reduce 42,018 MT CO_2e/yr in 2020. In 2030, they are expected to reduce 84,035 MT CO_2e/yr.

Figure 3-6: Transportation-Related GHG Emissions Reductions



MEASURE T-1:
REDUCE VEHICLE MILES TRAVELED IN NEW DEVELOPMENT

Measure Description

The following paragraphs describe the varying levels of policy implementation per area necessary to reduce vehicle miles traveled in unincorporated Yolo County. Table 3-3 demonstrates how policies will apply to different areas of the County in 2020.

Dunnigan Specific Plan Area

The Dunnigan Specific Plan, an area of significant planned growth, represents an excellent opportunity to reduce future communitywide GHG emissions. Once established, it is often hard to retrofit existing land use patterns to reduce automobile reliance. The Dunnigan Specific Plan offers a chance to create an entire sustainable community based on smart growth principles. The mixed land use patterns, neighborhood design, and alternative transportation networks will reduce emissions, decrease congestion, and improve the overall quality of life.

The Dunnigan Specific Plan is expected to accommodate 44% of the County's planned growth. Policy CI-3.19 requires development in the Specific Plan area to generate 44 VMT per household per day or lower, a considerable reduction compared to the 77 VMT per day the average unincorporated household is expected to generate. As a mandatory requirement, it is assumed that 100% of new growth in the Specific Plan will comply with the performance standard. Implementation of the land use and transportation policies in the Dunnigan Specific Plan is expected to reduce 34,308 MT CO_2e/yr in 2020 and 68,617 MT CO_2e/yr in 2030.

Table 3-3: 2020 Estimated Reduction in Transportation-Related GHG Emissions by Growth Area

Growth Area	% of GP Growth	% Compliance with VMT Standard	VMT/HH/ day	% Reduction	Weighted % Reduction	2020 GHG Reduction Potential
Dunnigan Specific Plan	44.4%	100%	44	42.9%	19.0%	34,308
Elkhorn Specific Plan	17.7%	33%	70	9.1%	1.6%	2,903
Esparto	8.4%	50%	64	16.9%	1.4%	2,567
Madison Specific Plan	7.6%	60%	67	13.0%	1.0%	1,774
Knights Landing	5.0%	25%	73	5.2%	0.3%	466
Total					**23.3%**	**42,017**

Other Existing Communities

The existing unincorporated communities of Elkhorn, Esparto, Madison, and Knights Landing combined are expected to accommodate 39% of new growth. General Plan Policy CI-3.21 directs new growth in these communities to reduce VMT to the extent feasible. As shown in Table 3-3, the County expects that the VMT reduction level will vary between these communities. Development in Esparto and Madison is likely to achieve lower levels of VMT than in Elkhorn and Knights Landing. Combined implementation of the General Plan land use and transportation policies in these

unincorporated communities is expected to achieve a reduction of 7,710 MT CO_2e/yr in 2020 and 15,418 MT CO_2e/yr in 2030.

Implementation

Reduction of transportation emissions is extremely difficult to achieve in the unincorporated area of a mostly rural county. Yolo County's GHG reduction efforts in new growth areas are ambitious. Achieving this level of reductions will be challenging and require concerted efforts over the next two decades.

General Plan Policy CI-3.20 requires future development projects in the County's specific plan areas to demonstrate achievement of the adopted VMT threshold. The County's Transportation Impact Study Guidelines provide detail regarding how projects will demonstrate compliance with the VMT requirements. The Guidelines specify that achievement will be measured using an appropriate travel demand forecasting model that is sensitive to land use and urban design variables (e.g., 4D analysis). The Guidelines also require all Dunnigan Specific Plan area projects to monitor VMT levels after construction.

A further requirement for development projects in specific plan areas is to broaden the transportation model by establishing mode split goals for walking, bicycling, and transit trips. The development of effective programs and facilities is essential to the County's vision for a multi-modal system and is closely related to the success of a project's overall transportation strategy. The requirements for VMT reduction and mode split analysis are important tools in ensuring that the County achieves its ambitious transportation-related GHG emissions reduction goals.

2020 GHG Reduction Potential:
42,018 MT CO_2e (16%)

2030 GHG Reduction Potential:
84,035 MT CO_2e (17%)

Community Co-Benefits:
Improve Air Quality
Enhance Public Health

Applicability:
New Development Countywide

ACTION		RESPONSIBILITY	TIMEFRAME
A	Achieve the VMT performance standards identified in the 2030 General Plan.	Planning & Public Works	Ongoing
B	Implement the Transportation Impact Study Guidelines	Planning & Public Works	Ongoing

PROGRESS INDICATORS		TARGET YEAR
A	100% of Dunnigan, 60% of Madison, 50% of Esparto, 33% of Elkhorn, and 25% of Knights Landing achieve VMT performance standards.	2020 & 2030

ENERGY

INTRODUCTION

Energy consumption (including electricity natural gas, and propane) generated 21% of Yolo County's GHG emissions in 1990 (131,652 MT CO_2e/yr). Since 1990, building energy-related emissions have grown by 38% to 181,447 MT CO_2e/yr in 2008. Current emissions are projected to grow to 404,929 MT CO_2e/yr by 2020 and 628,444 MT CO_2e/yr by 2030.

Background

Energy Sources

Pacific Gas and Electric (PG&E) provides both natural gas and electricity to unincorporated Yolo County. PG&E generates electricity at hydroelectric (16%), nuclear (22%), renewable solar, geothermal and biomass (14%), natural gas (39%), and coal (8%) facilities. In 2010, 52% of the unincorporated county's electricity use was GHG-free.

Under California's Renewable Portfolio Standard (RPS) discussed in Chapter 2, PG&E will be required to generate 20% of their retail electricity using qualified renewable energy technologies by the end of 2010. To comply with this mandate, PG&E will increase the percentage of its energy portfolio met through renewable sources by 6%. Regulations for a Renewable Electricity Standard were adopted in 2010 and increased the renewable generation goal to 33% by 2020.

Building Stock

In 1978, California established a set of energy efficiency standards for residential and non-residential units. These standards, referred to as the California Energy Code, or Title 24, Part 6 of the California Code of Regulations, are updated periodically to incorporate new energy efficiency technologies and methods. As a result of these standards, homes built within the last decade are approximately 4.5 times more efficient per square foot than homes built prior to 1960. For this reason, the age of a community's building stock has important implications for both building energy consumption and GHG emissions.

Residential

U.S. Census data shows that 45% of unincorporated Yolo County's residential housing stock was constructed prior to the 1978 Title 24 standards. One in ten homes was constructed prior to 1950. Homes of this vintage frequently have minimal insulation, antiquated furnace systems, single-pane windows, and drafty construction. While a portion of the housing stock has been retrofitted to include energy efficiency improvements, there is still a large potential for energy savings in most homes in the County.

Commercial

Similar to residential units, much of unincorporated Yolo County's non-residential building stock was constructed prior to Title 24. Commercial buildings built prior to 1980 often have inefficient heating, ventilation and air conditioning units. Additionally, lighting systems and major appliances such as refrigeration units can often be significantly improved.

Yolo County has a high potential for both photovoltaic and solar hot water heating systems; even in the winter, there is moderate potential for solar energy.

Yolo County has improved the energy efficiency of its own public facilities considerably through lighting, HVAC and appliance upgrades.

Consequently, the building stock offers considerable opportunity for cost-effective energy efficiency retrofits to decrease the use of both electricity and natural gas. The County plans to achieve building energy efficiency improvements in both existing and new residential units and commercial buildings through a combination of education, incentives, and regulation (see measure E-2).

Renewable Energy

Renewable energy can be produced using distributed generation facilities such as rooftop solar systems, or can be purchased through the utility grid from remote generation facilities. Presently, a limited number of renewable energy generation systems are located within Yolo County. As of 2010, approximately 194 buildings in the unincorporated county have installed solar photovoltaic systems totaling over 2 MW of capacity. Several solar facilities have been approved or are under preliminary consideration in locations throughout the county. Increasing local renewable energy generation and grid content will reduce communitywide GHG emissions.

Solar Energy Potential

National Renewable Energy Laboratory (NREL) data indicates that solar energy is the most promising option for future renewable energy generation. Yolo County receives enough energy from the sun to produce approximately 5.0 to 5.5 kilowatt hours per square meter per day ($kWh/m^2/day$). This level of solar insolation (i.e., the measure of solar radiation energy received on a given surface area in a given time) suggests a high potential for both photovoltaic and solar hot water heating systems in the county. Insolation levels fluctuate between summer and winter. However, during most of the year, solar energy potential is considered good to excellent. Even in the winter, Yolo County has moderate, but still acceptable, potential for solar energy.

To increase the portion of Yolo County's energy portfolio met through renewable sources, the County will require the installation of solar photovoltaic and solar hot water systems, both of which are effective technologies in the sunny climate of Yolo County (see measure E-7).

Water

Groundwater. Aquifers beneath Yolo County are essentially contained within two stratigraphic units: (1) the older thick alluvial and river sediments of the Tehama formation, and (2) the younger sediments of the Red Bluff formation, floodplain deposits, and stream channel deposits that overlie the Tehama formation. The aquifers are recharged by runoff and groundwater from the east-facing foothills, by percolation of precipitation, and by infiltration of surface water. Surface water infiltration is provided by the creeks and streams that flow from the Coast Ranges into the County; from delivered and applied irrigation water; from Sacramento and Feather River flood waters diverted to the Yolo Bypass; from the Sacramento River; and from the Sacramento River Deep

Water Ship Channel that extends south from West Sacramento.

Surface water. Most runoff that affects Yolo County originates outside of the County. Yolo County is a small portion, 3.8% (1,034 square miles) of the large Sacramento Hydrologic Region or watershed, which covers 26,960 square miles of land. The principal watersheds that affect Yolo County are the Sacramento River, Yolo Bypass, Colusa Basin Drain, Cache Creek, Willow Slough, and Putah Creek.

Energy is required to pump, transport, and treat potable water and wastewater, as well as to heat and cool it. These emissions are embedded within the energy emissions inventory. With water supplies expected to continue declining in coming decades, water conservation strategies have a double benefit of reducing emissions and aligning demand with future water availability. Emission reductions in the water sector are, in great part, driven by State legislation. Senate Bill (SB) 7 (2009), requires a reduction in per capita water consumption by 2020. The reduction must meet either the "standard target" (a 20% reduction from the average water demand between 1994 and 2004), or an "alternative minimum" target (a 5% reduction from the average water demand between 2003 and 2007). Thus, the water districts in Yolo County (i.e., Dunnigan Water District, Colusa Basin Drainage District, Yolo County Flood Control & Water Conservation District, Yolo-Zamora Water District, Reclamation Districts) have two paths from which to choose, which will have ramifications for the amount of water reduction that the county will need to achieve in order to comply with SB 7.

The Energy Strategy

Energy emissions can be reduced by lowering energy demand, improving water and energy efficiency, and increasing the amount of electricity and heat generated from renewable energy sources. The strategy proposed in this section consists of voluntary programs, County Code revisions, and mandatory ordinances. As outlined in the CAP, there are simple, cost-effective energy and water conservation strategies that residents, businesses, farmers, and local government can implement. The County is anticipating that these measures will have a net-positive economic effect, in addition to preparing county residents, businesses, and farms for a future with potentially more restricted and expensive energy and water resources.

The total GHG emission reduction potential of the Energy Strategy is estimated to be 180,425 MT CO_2e/yr in 2020 and 283,033 MT CO_2e/yr in 2030, or approximately 47% and 30% of the total GHG reductions achieved across both State and County GHG reduction measures in 2020 and 2030, respectively.

Measure Description

Assembly Bill 117 (2002) enables California cities and counties, either individually or collectively, to supply electricity to customers within their jurisdiction by establishing a community choice aggregation (CCA) program. Unlike a municipal utility, a CCA does not own transmission and delivery systems, but is responsible for providing electricity to residents and businesses. The CCA may own electric generating facilities, but more often, it purchases electricity from private electricity generators. Marin, Sonoma, Humboldt, and San Francisco Counties are in various stages of implementing a CCA.

The primary benefits offered by a CCA are local control over the energy sources used within the community, the ability to provide electricity to customers at lower overall cost, and greater use of renewable energy. Cost savings can accrue to customers through lower electric bills or can be used by the CCA entity (in this case, Yolo County) to provide enhanced services to its constituents. Cost savings are primarily attributed to:

- Lower financing costs for generation (e.g., tax-free revenue bonds),
- No stockholders and/or investors to pay, unlike the investor-owned utilities, and
- No income taxes, unlike the utilities.

Through a CCA, Yolo County can choose to structure a supply portfolio that achieves cost efficiencies, fuel and technological diversity, environmental improvements, and/or cost stability. The County can also choose to develop its own energy resources, consistent with the 2030 Yolo County General Plan. The provision of local sustainable energy projects would improve energy transmission efficiency, provide greater control over the energy portfolio, and would create economic development. The 2030 General Plan contains several policies and actions that require streamlined permitting and reduced fees for alternative energy development.

A CCA would facilitate implementation of an aggressive program to increase use of renewable energy resources and promote improved energy efficiency. As a reflection of these opportunities, the CAP assumes that the County will set the following 2020 targets for the CCA:

- 25% of consumers use PG&E's portfolio (0% by 2030)
- 50% of consumers purchase a "light green" portfolio comprised of 50% renewable sources (75% by 2030)
- 25% of consumers purchase a "deep green" portfolio comprised of 100% renewable sources (assumed to include a 10% cost premium) (25% by 2030)

Developing a CCA will require a detailed analysis of energy demand, efficiency opportunities, and renewable generation opportunities in the unincorporated area. Building on existing models from other counties is likely to reduce initial program design costs. The program would be most effective if the County partnered with cities and other jurisdictions and established a stakeholder advisory group.

The County will develop a detailed business plan that identifies organization, governance, rate structure, enrollment, electric resources, a financial plan, and an implementation strategy and schedule for the CCA.

The County will work with PG&E to ensure that implementation and roll-out of the CCA program establishes a clear division of procedures, responsibilities, and rights. For the ratepayer, all customers in a CCA program's service area automatically become customers of that CCA program unless they actively opt out of the CCA program. Ratepayers have the right to opt out of CCA procurement service during the CCA program's two 60-day formal notification periods. If the ratepayer opts out, PG&E would continue to procure electricity. In either event, PG&E would continue to manage the transmission, distribution, and delivery of the CCA's electricity, including providing meter reading, billing, and maintenance and outage response services. Additional PG&E services, including energy efficiency, California Alternate Rates for Energy, balanced payment plans, net metering, California Solar Initiative, other solar programs, the ClimateSmart™ program and some demand response programs, as well as programs such as eBills and Automated Payment Services would still be available to CCA customers in the county.

2020 GHG Reduction Potential:
117,285 MT CO_2e (45%)

2030 GHG Reduction Potential:
145,884 MT CO_2e (30%)

Community Co-Benefits:
Improve Air Quality
Reduce Energy Consumption

Applicability:
Countywide

ACTION		RESPONSIBILITY	TIMEFRAME
A	Prepare a preliminary feasibility study to determine the potential for and benefits of a community choice aggregation program in the County. Analyze energy production costs and establish a stakeholder advisory group. To the extent feasible, the CCA program shall be designed to prioritize the development of local energy projects.	County Administrator	Short-Term
B	Identify partners among Yolo County cities and other jurisdictions to participate in the Countywide CCA program.	County Administrator	Short-Term
C	Develop a detailed business plan that identifies organization, governance, rate structure, enrollment, electric resources, a financial plan, and implementation schedule for the proposed CCA.	County Administrator	Medium-Term
D	Develop a CCA implementation plan and submit to the California Public Utilities Commission as required by AB 117.	County Administrator	Medium-Term

PROGRESS INDICATORS		TARGET YEAR
A	Develop a CCA feasibility study and identify partner jurisdictions.	2012
B	Develop a business plan and implementation strategy for the CCA.	2015
C	50% of consumers purchase "light green" portfolio comprised of 50% renewable sources; 25% of consumers purchase "deep green" portfolio comprised of 100% renewable sources; 25% of consumers stay with PG&E portfolio.	2020
D	75% of consumers purchase "light green" portfolio comprised of 50% renewable sources; 25% of consumers purchase "deep green" portfolio comprised of 100% renewable sources.	2030

Measure Description

The County will develop a comprehensive program that encourages home and building owners to complete energy efficiency retrofits. Many residences (approximately 54%) in unincorporated Yolo County are owner–occupied, and thus the financial savings of home energy efficiency retrofits are in the long-term economic interest of the homeowner. Similar to the residential housing stock, a large number of industrial and commercial buildings were constructed prior to Title 24.

Voluntary Programs

The County conducted an energy conservation retrofit program for its own buildings in 2004, resulting in retrofitted light packages, boilers, economizers, chillers, fans, water heaters, motors, and HVAC systems, increasing energy efficiency and yielding a projected savings of $500,000 dollars annually over 15 years.

The County will build on these successes by emphasizing voluntary participation in countywide energy efficiency retrofit programs. To encourage participation from home and building owners, the County will leverage Energy Upgrade California's educational materials and online platform to provide access to incentives, technical assistance, and qualified contractors. The County will also promote resources to link home and building owners to educational and financial resources. Such programs include, but are not limited to:

- Yolo Energy Watch,
- California Flex Your Power,
- Department of Energy Weatherization Assistance Program (WAP),
- Utility programs such as free energy audits and building energy efficiency rebates and incentives; and
- EPA Portfolio Manager

The County will place particular emphasis on outreach to mobile home residents and owners and low-income households. This outreach will promote the WAP and other technical and financial assistance programs that could enable homeowners and residents to lower energy bills through no- to low-cost investments in energy efficiency retrofits.

Financing

Financing is critical to the success of the energy efficiency program. The County will continue to implement its Property Assessed Clean Energy (PACE) program to promote energy efficiency retrofits. This program allows qualified residential property owners to repay the cost of energy efficiency retrofits on their property tax bill.[1] Other low cost financing programs are available such as the Department of Housing and Urban Development PowerSaver program, which offers low interest loans for energy efficiency retrofits. Conventional means, such as home equity loans, are also available to finance energy efficiency.

[1] At the time of writing, the PACE program is being litigated in federal and state courts.

As part of this program, the County has established participation goals. For the 2020 planning horizon, 20% of residential units would complete an energy efficiency retrofit, with an average energy efficiency improvement of 15%; and 10% of non-residential buildings would complete an energy efficiency retrofit, with an average energy efficiency improvement of 20%. For 2030, participation rates increase to 70% of residential units and 30% of non-residential units.

2020 GHG Reduction Potential:
3,948 MT CO_2e (2%)

2030 GHG Reduction Potential:
12,322 MT CO_2e (3%)

Community Co-Benefits:
Improve Air Quality
Reduce Energy Consumption

Applicability:
Existing Development

ACTION		RESPONSIBILITY	TIMEFRAME
A	Promote the Energy Upgrade California Program, Yolo Energy Watch, and other incentive and technical assistance programs to residential and commercial property owners through County website.	Planning & Public Works	Short-Term
B	Implement the Property-Assessed-Clean-Energy (PACE) program, as adopted by the Board of Supervisors in January, 2010, as state and federal funds are available.	Planning & Public Works Buildings	Medium-Term
C	Amend the Yolo County Code to require that all residential and non-residential remodels/additions for homes, where the construction value exceeds 50% of the home/building value, improve overall energy efficiency by 15%.	Planning & Public Works Buildings	Long-Term
D	Work with Community Action Agencies (e.g., North Coast Energy Services) to increase participation by eligible low-income residents and mobile home owners in the WAP and the Low-Income Home Energy Assistance Program (LiHEAP).	Planning & Public Works	Short-Term

PROGRESS INDICATORS		TARGET YEAR
A	20% of residential units complete an energy efficiency retrofit, with an average energy efficiency improvement of 15%.	2020
B	10% of non-residential buildings complete an energy efficiency retrofit, with an average energy efficiency improvement of 20%.	2020
C	70% of residential units complete an energy efficiency retrofit, with an average energy efficiency improvement of 15%.	2030
D	30% of non-residential buildings complete an energy efficiency retrofit, with an average energy efficiency improvement of 20%.	2030

ITIAL

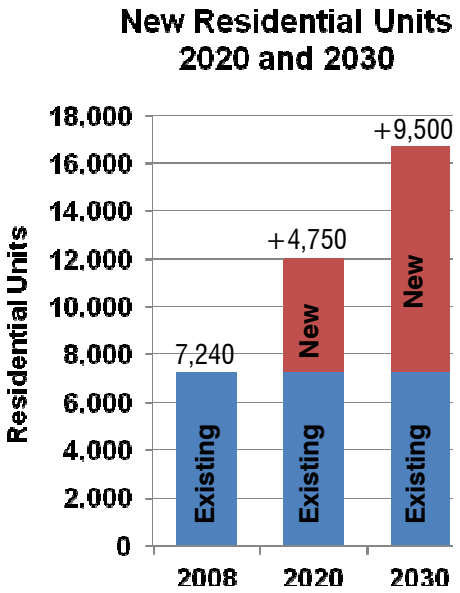
Measure Description

The County's 2009 Building Code contains a list of basic energy conservation measures that new development must meet, however no specific energy performance standard is stipulated (Section 8.7.402). In contrast, the California Green Building Code (Part 11 of the California Building Standards Code in Title 24 of the California Code of Regulations), also known as the CalGreen standards, contain benchmarks for energy performance, as opposed to a prescriptive list of energy efficiency measures. The CalGreen standards went into effect statewide on January 1, 2011.

The CalGreen standards also provide the County an option to adopt energy efficiency standards that surpass basic State requirements. CalGreen contains two options for energy performance in new construction: Tier 1 requires a building's energy performance to exceed Title 24 requirements by 15%, while Tier 2 increases this standard to 30%. The County will amend the Building Code to set an energy performance standard of 15% above Title 24 baseline for new residential development (excluding affordable housing) equivalent to Tier 1. All new homes over 3,500 square feet would be *required* to achieve or exceed the Tier 2 CalGreen standard (30% above Title 24 baseline). Due to the current business climate, commercial and industrial development would be required to meet the new standard of 15% above Title 24 in 2013.

The CalGreen standards are performance-based, allowing the builder to achieve enhanced efficiency by incorporating a variety of building practices and materials. Increasing the energy efficiency of new residential units and commercial buildings should not only reduce energy consumption in the community, but could also considerably reduce homeowner and business energy bills.

The County will also develop a program that encourages exemplary performance in new residential and commercial development. Buildings achieving Tier 2 performance or better would be able to sell credit for the emission reductions or energy savings that exceed 15% to other developers within Yolo County. As part of the exemplary performance program, the County expects that 2% of both new residential (under 3,500 sq. ft.) and non-residential units will achieve exemplary



performance (Tier 2) and 0.5% of new buildings will achieve zero-net energy demand by 2020. By 2030, these participation rates increase to 12% of new residential and non-residential units achieving exemplary performance and 2% of new buildings achieving zero-net energy demand.

A range of incentives and technical assistance are provided by federal and state agencies, and well as the energy utility that can help new developments meet these standards.These programs can be leveraged to encourage high-performance new building design and construction within commercial buildings. These programs offer building owners and design teams a wide range of services, such as design assistance; design team incentives; owner incentives; and an educational resource.

2020 GHG Reduction Potential:
31,852 MT CO_2e (12%)

2030 GHG Reduction Potential:
67,200 MT CO_2e (14%)

Community Co-Benefits:
Improve Air Quality
Reduce Energy Consumption

Applicability:
New Development

ACTION		RESPONSIBILITY	TIMEFRAME
A	Amend the Yolo County Code to require that all new residential construction (excluding affordable housing) exceed the California Energy Code 2008 Energy Efficiency standards (Title 24) by 15% (consistent with CalGreen Tier 1 standards).	Planning & Public Works	Short-Term
B	Amend the Yolo County Code to require that all new homes with over 3,500 square feet of livable space exceed the California Energy Code 2008 Energy Efficiency standards (Title 24) by 30% (consistent with CalGreen Tier 2 standards).	Planning & Public Works	Short-Term
C	Amend the County Code to require all new non-residential construction to exceed the California Energy Code 2008 Energy Efficiency Standards (Title 24) by 15% beginning in 2013.	Planning & Public Works	Short-Term
D	Create a program to allow commercial builders who exceed the California Energy Code Energy Efficiency standards (Title 24) by 30% (consistent with CalGreen Tier 2 standards) or more to sell credit for emission reductions or energy savings exceeding 15% to other developers within Yolo County.	Planning & Public Works	Medium-Term

PROGRESS INDICATORS		TARGET YEAR
A	97.5% of new buildings (residential over 3,500 square feet of livable space and non-residential) achieve Tier 1 energy performance.	2020
B	2% of new buildings (residential and non-residential) achieve exemplary performance (Tier 2) and 0.5% of new buildings achieve zero-net energy demand.	2020
C	86% of new buildings (residential over 3,500 square feet of livable space and non-residential) achieve Tier 1 energy performance.	2030
D	12% of new buildings (residential and non-residential) achieve exemplary performance (Tier 2) and 2% of new buildings achieve zero-net energy demand.	2030

TION

Measure Description

On-site renewable energy generation is an effective way to reduce demand for grid energy. With the combination of available rebates, tax incentives, and financing programs, climate- and region-appropriate technologies such as solar hot water heating and solar photovoltaic systems have become a cost-effective means to increase renewable energy generation capacity in Yolo County. Other technologies should also be pursued and encouraged, including but not limited to heat capture, methane capture, and anaerobic waste digesters. Facilities and operations that can demonstrate equivalent reductions to solar systems using alternative on-site renewable energy generation technologies are in compliance with this measure.

Solar Hot Water

Solar hot water systems offer a simple and reliable way to harness the sun's energy to provide hot water. Solar collectors, absorb the sun's energy to heat water stored in a tank.

The State has recognized the value of solar hot water heaters. Assembly Bill (AB) 1470 (2007) created a 10-year program to support installation of solar water heaters in homes and businesses. AB 1470 was designed to lower the initial costs of purchasing a system, which average $3,000 to $6,000.
With available incentives, solar hot water systems can also be a cost-effective replacement for inefficient water heaters. According to the California Solar Initiative (CSI), solar hot water systems can lower energy bills by meeting 50% to 80% of hot water needs annually. Though the high capital cost of solar water heaters can present a financial burden to homeowners, a range of financing and rebate options are available to offset initial investments.

Solar Photovoltaics (PV)

Solar photovoltaic (PV) systems generate electrical power by converting solar radiation into direct current electricity using semiconductors. PV power generation uses solar panels comprised of cells containing photovoltaic material. PV systems can be retrofitted into existing buildings, usually by mounting them on an existing roof structure or wall. Yolo County has an excellent solar potential of between 5.0 and 5.5 $kWh/m^2/day$, which is sufficient to support solar PV installations that would cover a large percentage of an average home's electricity demand. To date, CSI has facilitated the installation of 16.7 Megawatts (MW) of solar PV in Yolo County, including within incorporated cities. Approximately 194 buildings have installed solar PV systems in the unincorporated areas, costing just under $8 per watt-installed.

Renewable Energy Program

The County will develop a comprehensive solar program that encourages home and building owners to install solar hot water and PV systems. The County will aim to maximize community participation, and encourage homeowners to leverage the Energy Upgrade California program. The County can use CSI materials to encourage home and building owners to request free audits provided by private solar financing and installation companies.

As part of this program, the County anticipates that by 2020, 90% of new residential units (excluding affordable housing) and 15% of existing residential units

will install solar hot water heaters. Due to the current business climate, new commercial development would be required to install solar hot water heaters beginning in 2013. As a result the CAP assumes that 100% of new and 5% of existing commercial buildings after 2013, will install solar hot water heaters. The County expects that participation in the solar PV program will be smaller relative to the solar hot water program due to the higher system cost of solar PV. Expected participation rates for the solar PV program are as follows: 90% of new residential units (excluding affordable housing) and 5% of existing residential units; 100% of new commercial buildings (beginning in 2013); and 200,000 square feet of existing commercial rooftops. In addition, by 2030 the County anticipates that 40% of existing residential and 10% of existing commercial will install solar hot water heaters, and 10% of existing residential and 300,000 square feet of existing commercial rooftops will install solar PV.

A number of financing options may be used to reduce upfront costs, such as the

2020 GHG Reduction Potential:
24,870 MT CO_2e (10%)

2030 GHG Reduction Potential:
52,032 MT CO_2e (11%)

Community Co-Benefits:
Improve Air Quality
Reduce Energy Consumption

Applicability:
New and Existing Development

ACTION		RESPONSIBILITY	TIMEFRAME
A	Develop an outreach program to promote the Energy Upgrade California program for residential property owners.	Planning & Public Works	Medium-Term
B	Implement the PACE program, as state and federal funds are available.	Planning & Public Works	Medium-Term
C	Develop an outreach program to promote financial incentives available through CSI for installing solar hot water systems.	Planning & Public Works	Medium-Term
D	Amend the County Code to require all new residential (excluding affordable housing) and commercial development (beginning in 2013) to install solar hot water systems.	Planning & Public Works	Short-Term
E	Amend the County Code to require all new residential development of four units or more and non-residential development to install solar photovoltaic systems capable of providing 10% or more of the development's total projected electricity consumption.	Planning & Public Works	Short-Term

PROGRESS INDICATORS		TARGET YEAR
A	Complete County Code amendments.	2012
B	90% of new and 15% of existing residential units and 100% of new and 5% of existing commercial buildings install solar hot water heaters.	2020
C	90% of new residential units (excluding affordable housing) and 5% of existing residential units and 100% of new commercial buildings (beginning in 2013) and 200,000 sq ft of existing commercial rooftops install solar PV.	2020
D	100% of new and 40% of existing residential units and 100% of new and 10% of existing commercial buildings install solar hot water heaters.	2030
E	100% of new and 10% of existing residential units and 100% of new commercial buildings and 300,000 sq ft of existing commercial rooftop install solar PV.	2030

County's PACE program, low cost financing programs such as HUD PowerSaver, federal tax incentives through the Energy Policy Act of 2005, and financial incentives through AB 1470. The County will continue to implement its PACE program, which allows qualified property owners to repay the cost of renewable energy systems on their property tax bill. Other financing models, such as power purchase agreements (PPAs), can be used to offset the initial capital cost of installing a solar PV system. Home and building owners can finance renewable systems by accessing a variety of financing programs, and will also be able to capitalize on additional rebates through CSI.

IES

Measure Description

Biomass energy is generated from plant-materials, including sources such as food crops and agriculture and forestry residues. A number of technologies are available to convert biomass into renewable energy. The facilities may generate energy directly, in the form of heat or electricity, or may convert it to biofuel or combustible biogas. Yolo County produces a substantial quantity of agricultural residues, which could serve as a fuel source to create renewable energy.

Dixon Ridge Farms, located in the City of Winters, has developed a 50-kW biogas powered generator that converts walnut shell refuse into energy. The CEC provided a grant for the generator and the farm owner paid for construction. These costs were recouped through energy savings. The energy is used to fuel drying facilities, heat buildings, and generate electricity.

In recognition of this opportunity, the County will develop a farmer-to-farmer workshop program promoting opportunities for on-farm renewable energy generation. Yolo Energy Watch can assist in arranging training for the workshop. The County anticipates that 1 MW of renewable energy will be generated on farms in the unincorporated County (excluding solar water pumps) by 2020. By 2030, this is anticipated to increase to 2 MW.

2020 GHG Reduction Potential:
316 MT CO_2e (<1%)

2030 GHG Reduction Potential:
632 MT CO_2e (<1%)

Community Co-Benefits:
Reduce Energy Use
Support Agriculture

Applicability:
New and Existing Agriculture

ACTION		RESPONSIBILITY	TIMEFRAME
A	Develop a farmer-to-farmer workshop program that promotes opportunities for on-farm renewable energy generation facilities through demonstration projects.	Planning & Public Works	Medium-Term
B	Identify funding sources to finance investments in renewable energy for agricultural operations.	Planning & Public Works	Short-Term

PROGRESS INDICATORS		TARGET YEAR
A	Identify funding sources to finance investments in renewable energy for agricultural operations.	2012
B	Develop a farmer-to-farmer workshop program.	2014
C	1 MW of renewable energy generated on farms in the unincorporated County (excluding solar water pumps).	2020
D	2 MW of renewable energy generated on farms in the unincorporated County (excluding solar water pumps).	2030

N
BING

Measure Description

Many residential units and commercial buildings in the unincorporated county are more than 30 years old. The efficiency of water fixtures and appliances has improved since that time, and replacing antiquated equipment would create valuable water conservation benefits.

The partnership will provide technical assistance, free water audits, and rebate incentives. To improve indoor water efficiency, programs will focus on upgrading water fixtures and fixture fittings, repairing leaks, and new appliances.

This measure will help the water districts to comply with the SB 7 mandated reduction in per capita urban water consumption (20% reduction by 2020). The measure will also support the implementation of SB 407, which establishes requirements for residential units and commercial buildings constructed and occupied before 1994 to replace water inefficient plumbing fixtures. The County expects that 100% of residential units built prior to 1994 will improve fixtures and fixture fitting water efficiency by 15% by 2020 and by 20% by 2030. Leak repair is expected to reduce 6% or water use in 40% of existing residential units and commercial buildings.

2020 GHG Reduction Potential:
2,103 MT CO_2e (1%)

2030 GHG Reduction Potential:
4,100 MT CO_2e (1%)

Community Co-Benefits:
Reduce Water Use

Applicability:
New and Existing Development

ACTION		RESPONSIBILITY	TIMEFRAME
A	Amend the County Code to require that residences built prior to 1994 be retrofitted with water efficient fixtures prior to resale.	Planning & Public Works	Short-Term
B	Develop a program in coordination with Yolo County water districts to promote voluntary water efficiency retrofits for existing buildings through technical assistance, free water efficiency audits and rebate incentives.	Planning & Public Works	Short-Term

PROGRESS INDICATORS		TARGET YEAR
A	100% of residential units built prior to 1994 improve fixture and fixture fitting water efficiency by 15%.	2020
B	40% of existing residential units and commercial buildings reduce water consumption by 6% through water leak repair.	2020
C	100% of residential units built prior to 1994 improve fixture and fixture fitting water efficiency by 20%.	2030

Measure Description

After agricultural irrigation, landscape irrigation is one of the largest uses of potable water in Yolo County. A typical home or business with landscaping may use half or more of its total potable water demand for irrigation. Thus, designing landscapes to favor low-water demand plants adapted to the local climate is one of the most cost-effective ways to reduce potable water use. To complement plant selection, installing weather-based irrigation controllers that adjust irrigation in response to weather and soil moisture conditions and employing more water-efficient turf management practices can further reduce water use.

Weather-based Irrigation Controllers

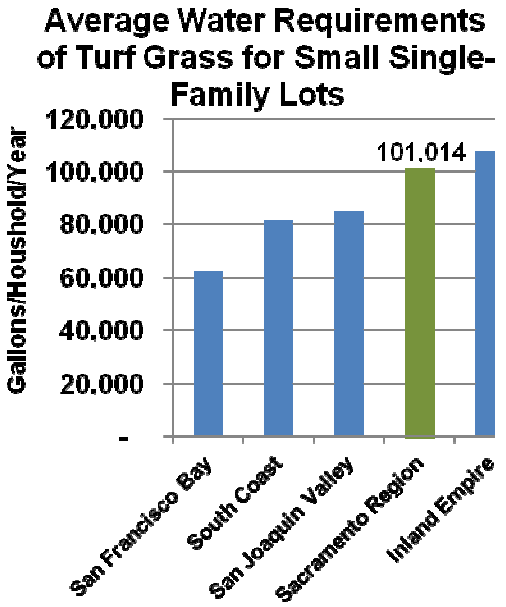
To maximize water efficiency in turf and other grasses, irrigation programs should be based on cumulative evapotranspiration losses, soil moisture retention, effective root depth, infiltration rates, and the type of turf being irrigated. An irrigation program set up on a calendar basis is much less efficient than one based on these criteria. Daily water use can be estimated using pan evaporation measurements available from weather stations.

Weather-based irrigation controllers (WBICs) work on a simple principle: they provide an appropriate watering schedule, adjust for weather changes, and irrigate based on landscape needs. A smart controller automatically reduces watering times as weather gets cooler and less water is needed. As the weather begins to warm, the controller adds more watering time. The controller is typically set for a default maximum watering time, based on the hottest time of year. The controller then reduces that time when less water is needed.

By allowing for more accurate, customized irrigation, WBICs save water by reducing demand and allow irrigation to be tailored to a landscape's specific plant and climate needs. To support WBIC use, the County will include information on the benefits of WBICs in current outreach efforts to private landscape owners and managers. To raise standards for future development, the County will also amend the County Code to require new residential and commercial development to install weather-based irrigation controller systems.

Turf Management

Turf management practices affect water resources, property values, and the safety of youth and adult sports participants.



Professional turf managers are challenged to meet shifting customer demands while also meeting safety and quality standards and protecting the environment. Developing, communicating and adopting best management practices are critical steps to maintain the quantity and quality of golf courses and sports fields and can protect the integrity of the ecosystem. To support improved turf management practices, the County has recently amended the County Code to incorporate the State Model Water Efficient Landscape Ordinance. To raise standards for future development, the County will also amend the County Code to limit irrigated turf to no more than 25% of the front yard area in new residential development.

As part of this program, the County expects that 2% of residential (single-family and multi-family) and 5% of commercial buildings will reduce landscape water consumption by 20% using WBICs and water efficient turf management practices by 2020. For 2030, these participation rates increase to 25% for residential and 50% for commercial buildings.

2020 GHG Reduction Potential:

51 MT CO_2e (<1%)

2030 GHG Reduction Potential:

862 MT CO_2e (<1%)

Community Co-Benefits:
Reduce Water Use
Restore Natural Habitat

Applicability:
New and Existing Development

ACTION		RESPONSIBILITY	TIMEFRAME
A	Pursuant to the 2011 International Building Code, require that all automatic irrigation systems controllers be weather-based.	Planning & Public Works	Short-Term
B	Amend the County Code to limit turf to no more than 25% of the front yard area in new residential development.	Planning & Public Works	Short-Term

PROGRESS INDICATORS		TARGET YEAR
A	Complete County Code amendments.	2010
B	2% of residential (single-family and multi-family) units reduce landscape water consumption by 20%	2020
C	5% of commercial buildings reduce landscape water consumption by 20%	2020
D	25% of residential (single-family and multi-family) units reduce landscape water consumption by 20%	2030
E	50% of commercial buildings reduce landscape water consumption by 20%	2030

The County also considered the following additional measures as part of the Energy Strategy. The County will continue to monitor the feasibility of these supporting measures, and may employ one or more of these measures to achieve the 2030 GHG reduction target.

Energy Efficient Appliances, Lighting, and Equipment in Existing Buildings

The energy efficiency programs described in Measure E-3 and the energy performance standards described in Measure E-6 focus on energy conservation measures for the building envelope (i.e., wall and loft insulation, high performance glazing, etc.) and critical building systems (i.e., HVAC, hot water heating, etc.). Appliances, equipment, indoor and outdoor lighting are also important components of building energy demand. The County will continue to work with Yolo Energy Watch to promote energy efficient appliances, and will develop a program to promote smart grid technologies.

Energy Efficient Appliances

Though many new technologies and equipment claim to be energy efficient, the only nationally recognized standard for energy efficient appliances and products is the EPA's Energy Star rating system. According to the EPA, devices that have an Energy Star certification, such as office equipment, home appliances, and lighting products, generally use 20% to 30% less energy than required by federal standards. By promoting Energy Star-rated home and business appliances, the County can reduce GHG emissions from lighting, refrigerators, dishwashers, clothes washers, wall air conditioning units, computers, photocopiers, and lights.

This measure is designed to encourage voluntary community participation to upgrade home and business appliances and lighting to Energy Star or other energy efficient models. Successful implementation relies on leveraging the Energy Upgrade California program materials and public platform through a public outreach campaign to increase community awareness regarding energy efficient appliance choices. The County will also partner with PG&E, Yolo Energy Watch, and other organizations to promote existing financial incentives and rebates for energy efficient appliance upgrades and replacements.

Smart Grid

The 'smart grid' is an emerging energy management system which uses

information technology to improve how electricity is managed and controlled. Smart meters link energy users to the smart grid.

As of October 2010, PG&E had installed SmartMeters™ in approximately 96% of the buildings in Yolo County. Current smart meters allow for frequent remote reading of energy use. However, the true value of the smart meter program will be fully realized when community residents and businesses are able to make more informed energy use decisions based on the future two-way communication capability expected from SmartMeters™, such as when a homeowner is able to program their washing machine to run when energy is cheapest to obtain.

When estimating the potential emission reductions associated with implementation of the smart grid, the County included the energy efficiency improvements gained from integrating smart grid energy management systems for control lighting, heating, ventilation, and air conditioning and other major appliances in residential units and commercial buildings.

To facilitate further use of energy efficient and smart grid-compliant appliances, lighting, and equipment, the County will amend the County Code to require that all major appliances and lighting be Energy Star-rated in any residential and/or non-residential remodels/additions that exceed 50% of the home or building value.

Require Energy Efficient Appliances, Equipment, and Lighting in New Construction

This measure includes amendments to the County Code to mandate home appliance and lighting upgrades to Energy Star or other energy-efficient models in new construction. Successfully educating development contractors about these upgrades and the manner in which they can be financed relies on the County's effective use of Yolo Energy Watch programs to increase community awareness regarding energy efficient appliance choices.

Modern technology has contributed to the development of high-quality, energy efficient appliances. The Energy Star rating is an internationally recognized standard for energy efficient consumer products. According to the EPA, Energy Star-certified devices, such as office equipment, home appliances, and lighting products, generally use 20% to 30% less energy than required by federal standards. The County will partner with PG&E, Yolo Energy Watch, and other organizations to promote existing financial incentives and rebates for energy efficient appliance upgrades and replacements.

The County will amend the Code to require a) all new residential units and commercial buildings to use Energy Star-rated major appliances and lighting, b) new commercial and industrial buildings to incorporate high-efficiency (e.g., LED) exterior lighting, c) development using centralized lighting systems to include pre-programmed response strategies capable of reducing the total lighting load by at least 30% through dimming controls or bi-level switching. In addition, the County will

require all development in the Dunnigan Specific Plan to integrate smart grid technology into buildings and major appliances.

Certain energy efficient lights (i.e., compact fluorescent lights [CFLs]) contain hazardous materials which require proper handling and disposal. All households and businesses must collect CFLs and ship them, or take them to a proper facility where the materials are shipped to proper facilities for recycling/disposal. For Yolo County households and small businesses, this requires driving to the central landfill's hazardous waste facility to dispose of these materials. Additionally, proper disposal and recycling of the collected less energy efficient fluorescent lights represents a significant cost to the County.

Pursue a District Energy Program in High Density, Mixed-Use Development

According to the International District Energy Association, the fundamental idea of district energy is simple but powerful: connect multiple heating and cooling energy users (buildings) through an underground piping network to environmentally responsible energy sources (central plants), such as combined heat and power (CHP), industrial waste heat, and renewable energy sources such as biomass, geothermal, and solar.

District energy systems produce and pipe steam, hot water or chilled water underground through a dedicated piping network to heat or cool buildings within a concentrated area. This program reduces energy costs and GHG emissions, while freeing up valuable space in customer buildings by centralizing production equipment. It also reduces costs through economies of scale and equipment management, and optimizing the use of fuels, power and resources. District energy systems in North America typically serve "clusters" of buildings, which are sometimes commonly owned, such as university campuses or hospitals. However, in urban systems, the customer buildings have distinct and separate owners; are generally located near each other in a central business district, and are interconnected individually to the distribution network. The number of customer buildings served by a typical district energy system may range from as few as three or four in the early stages of a new system to as many as 1,800+ customer buildings served by the Con Edison Steam Business Unit in Manhattan, the largest district steam system in the world.

Principal Benefits of District Energy

With district energy, building developers and owners would not have to determine specific heating and cooling equipment, nor would they need to dedicate significant

space within their buildings for boilers or cooling equipment. This difference could lead to improved efficiency, as individual developers and building owners often oversize their equipment and are reluctant to consider investments that have payback periods of more than three years.

District energy systems are also capable of accommodating improved energy technology over time. For instance, a district energy system can change equipment at the central plant as opposed to expensive retrofits within each building.

The Dunnigan Specific Plan represents the centerpiece of a new approach in Yolo County towards rural community development and sustainability, and would have sufficient density and mix of uses to utilize a district energy system. A district energy system would support the goal of the Dunnigan Specific Plan to incorporate green construction standards and energy efficiency measures throughout the entire community (including community design, infrastructure sizing, building construction, and landscaping).

Encourage Industrial Process Energy Efficiency

The food processing industry in Yolo County is an important, diverse, and dynamic industrial sector in the County's overall economy. Over the past 20 years, increasing population and urbanization have brought on greater regulatory requirements and sharper competition among all industries for water and energy. Production of wastes and its associated liabilities has become a significant cost factor limiting the growth of operations. Increasing labor costs, high natural gas and electricity prices, the 2001-2002 energy reliability crises, environmental regulations, higher costs for operating older, inefficient factories, and global market competition have created a challenging economic environment for industrial and manufacturing firms throughout the state. In Yolo County, these factors have resulted in factory closures and consolidation of food processing facilities, including the Hunt-Wesson cannery and R.H. Phillips winery.

Industrial and manufacturing processes consume an enormous amount of energy. Some large, newly constructed factories (Cheese and Protein International, Tulare; Brawley Beef, Brawley) and pilot plants (ConAgra, Irvine; Creative Research Management, Stockton) have incorporated automated and energy efficient technologies to achieve economic advantages. Often, inefficiencies are due to operating and maintenance practices. Fortunately, making even small energy-efficient changes to manufacturing processes can save money.

State agencies (e.g., California Energy Comission) and utilities offer a range of technical assistance, free audits, and financial incentives to encourage agricultural processing and industrial facilities to evaluate and implement energy efficiency and conservation strategies in their facilities.

Reduce Embodied Energy Content of Construction Materials

GHG emissions are created throughout the lifecycle of building materials, from resource extraction or excavation, through the production process, transportation, use of finished products, and disposal. By instituting a recycled, or locally made or locally extracted, materials requirement, the County can ensure that the building community is using best-available green building products during construction. This promotes good construction management by encouraging recycling of building materials, reusing salvaged products after demolition and using locally available and durable materials.

Promote Greywater and Rainwater Collection and Non-Potable Water Systems

Reusing greywater and rainwater on-site is an effective way to reduce water demand. These systems collect water from buildings and landscapes, then reuse it for other indoor and outdoor applications that do not require water quality beyond a basic level of treatment. Greywater includes all non-toilet wastewater generated in a typical household from bathtubs, showers, bathroom sinks and washing machines. Rainwater can also be captured and used in the same fashion as greywater. With minimal treatment, rainwater and greywater can be reused to flush toilets and run washing machines (and outside for drip irrigation). This measure promotes indoor and outdoor reuse of greywater and rainwater.

Since this measure is not widely used in building and landscape construction currently (and was only recently made legal), it requires the County to promote new approaches to building and landscape plumbing. However, with the adoption of SB 1258 (2008), which directs the Department of Housing and Community Development to develop a more wide-ranging set of standards for residential greywater systems for both indoor and outdoor use, no additional policy changes are necessary for the County to proceed with a program to promote the use of greywater and rainwater within buildings. The program may include education about approved systems that follow current building code, installation and maintenance assistance, and support for demonstration projects.

To build on current County efforts and recent changes in State policy, the County will amend the County Code to explicitly allow the installation and use of greywater systems that conform to Title 24, Part 5 of

the California Plumbing Code, as well as to require use of rainwater collection or greywater irrigation systems in new residential and non-residential landscapes.

Establish a Standard of No Net Increase In Water Demand For New Buildings

New development will create much of the expected growth in water demand in the next two decades. Fortunately, reducing water use in new development can be achieved in a cost-effective manner by investing in water-efficient fixtures and fixture fittings (see measure E-6), using weather-based irrigation control systems and turf management programs (see measure E-7), and non-potable water systems, among other water efficiency and conservation strategies.

Additionally, the County will amend the County Code to include specific requirements for water efficient technology in new residential construction, as well as a standard for reducing overall potable water use.

SOLID WASTE AND WASTEWATER

INTRODUCTION

Waste-related GHG emissions result from personal consumption and waste disposal patterns, as well as from pre-consumer commercial and industrial processes. In Yolo County, less than 1% of unincorporated communitywide GHG emissions were associated with solid waste generation and disposal in landfills (1,654 MT CO_2e/yr) in 1990. Since then, solid waste emissions have increased to 6,871 MT CO_2e/yr in 2008. These emissions are projected to continue to grow to 12,660 MT CO_2e/yr by 2020 and 18,449 MT CO_2e/yr by 2030. As shown in the graph to the right, waste disposal rates peaked around 2005, and have been dropping since that time. The waste strategy seeks to build on this momentum by increasing waste diversion and reduction.

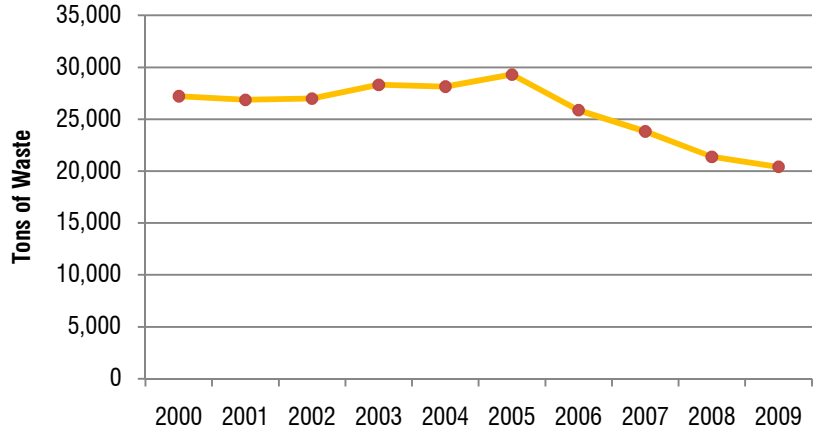
Emissions are created when organic waste (e.g., food scraps, yard clippings, paper, and wood) is buried in landfills and anaerobic digestion takes place, emitting methane, a potent GHG.

The County contracts with two companies, USA Waste and Davis Waste Removal to provide commercial and residential waste collection and recycling. The County recognizes that due to the limited amount of local waste, costs have increased for some waste diversion programs subsidized by waste disposal tip fees, making disposing of solid waste more expensive. Yolo County Central Landfill has approximately 70 to 80 years of space remaining, and other nearby landfills also have many years of space remaining.

Due to limited remaining landfill space in Northern California, disposing of solid waste will become more expensive. Presently, most waste reduction practices focus on diverting waste products from landfills through recycling. However, it is also important to consider programs that reduce waste generation, as well as product and material reuse alternatives. Encouraging consumer choices and waste reuse, reduction, and recycling habits affect overall community waste generation.

The total GHG reduction potential of the Solid Waste and Wastewater strategy is 9,366 MT CO_2e/yr in 2020 and 13,649 MT CO_2e/yr in 2030, or approximately 2% and 1% of the total GHG reductions of the CAP, respectively.

Figure 3-7:
Waste Disposal in Unincorporated Yolo County



Source: Yolo County Planning and Public Works Division of Integrated Waste Management, 2010

Measure Description

Currently about 25% of solid waste generated in unincorporated Yolo County is deposited in landfills (i.e., approximately 75% of waste is diverted from the landfill), where bacteria decompose organic material. Landfill gas (LFG) is created from both bacterial decomposition and oxidation of organic wastes. The gas is composed of approximately equal concentrations of methane (CH_4) and carbon dioxide (CO_2), as well as smaller amounts of non-methane organic compounds (NMOC), nitrogen (N_2), oxygen (O_2) and other trace gases. If not collected and destroyed, over time, most of this landfill gas is released to the atmosphere. Some of the landfill gas is destroyed as it migrates through the landfill's cover materials before it can escape the landfill. Methane (CH_4) is especially problematic, as the molecule has a global warming potential 23 times more potent than CO_2. The primary focus of mitigation efforts at the Yolo County Central Landfill is to prevent emissions by collecting the landfill gas, destroying the methane component of the landfill gas through combustion, and generating electricity in the process. Measures should be taken to ensure that the LFG is filtered and refined to the point where potentially harmful pollutants are not emitted when the gas is burned.

Captured landfill gas may be combusted or "destroyed" on-site, transported for off-site use (e.g., through gas distribution or transmission pipeline), or used to power vehicles. Landfill gas collection systems typically consist of wells, pipes, blowers, caps and other technologies that enable or enhance the collection of landfill gas and convey it to a destruction facility.

At some landfills, a flare is the only device where the gas is destroyed. Other projects use landfill gas to generate electricity or process heat using technologies such as turbines, reciprocating engines, fuel cells, boilers, heaters, or kilns. Most projects that produce electricity or process heat also include a flare to destroy gas during periods when the gas utilization project is down for repair or maintenance. Piping landfill gas to be destroyed by an industrial end user at an off-site location is also an eligible approach to destroy the landfill gas.

CalRecycle has identified a Climate Action Team strategy to increase landfill methane capture and reduce methane emissions. The *Landfill Methane Capture Strategy* includes three core components:

- Install new methane control systems at landfills currently lacking them.
- Maximize landfill methane capture efficiencies by optimizing landfill design, operation, and closure/post-closure practices.
- Increase recovery of landfill gas for use as a biomass renewable energy source to replace energy from nonrenewable fossil fuel sources.

The Yolo County Central Landfill already has a landfill gas system installed to capture LFG and use the gas to generate electricity. The opportunity for improvement is the potential to increase the capture rates or control efficiency of the system. The current control efficiency, or the ratio of the amount of LFG collected versus

generated, achieved at the Central Landfill is approximately 75%. Implementation of best practices could increase the control efficiency to around 90%.

These best practices could consist of closing the landfill's older open waste management units by replacing the intermediate soil caps with a multi-layer cap designed to minimize emissions, a process not likely to occur until each unit is filled to capacity around 2020. The current number of landfill gas collection wells and piping within these units will not be expanded significantly.

2020 GHG Reduction Potential:
9,366 MT CO_2e (4%)

2030 GHG Reduction Potential:
13,649 MT CO_2e (3%)

Community Co-Benefits:
Improve Air Quality
Expand Renewable Energy

Applicability:
Existing Landfills

ACTION		RESPONSIBILITY	TIMEFRAME
A	Enhance and expand existing landfill gas collection and destruction systems (90% control efficiency) at the Yolo County Central Landfill.	Planning & Public Works Central Landfill Operator	2020

PROGRESS INDICATORS		TARGET YEAR
A	Achieve 90% methane capture (control efficiency) at the Yolo County Central Landfill.	2020 & 2030

The County also considered the following measures as part of the Solid Waste and Wastewater Strategy. The County will continue to monitor the feasibility of these supporting measures, and may employ one or more of these measures to achieve the 2030 GHG reduction goal.

Reduce Waste Emissions from Organic Materials

Organic waste comprises more than half of the waste stream in unincorporated Yolo County. Composting, nature's own way of recycling, is the controlled decomposition of organic waste and material such as leaves, twigs, grass clippings, and vegetable food waste. Compost is the soil amendment product that results from composting. Whether done on-site, at the point of waste generation, or in a centralized facility, composting helps to keep organic material out of landfills and turns it into a useful product. Though not a carbon-neutral activity due to small amount of methane and nitrous oxide that are released in the process, on-site composting reduces the cost of hauling material and is generally exempted from solid waste regulations. Centralized facilities can handle more material and potentially produce a more consistent product, but may face regulatory issues in appropriately processing organic waste.

Anaerobic Organic Waste Digestion

Anaerobic digestion involves the use of microorganisms to break down wet organic waste, such as food scraps. This is not a new process; it has been used in the County landfill for more than a decade. However, new applications are being developed that would allow wet organic waste to be extracted from landfills and taken to central processing facilities. This resulting methane is converted into energy, instead of allowing it to be released into the atmosphere. This new technology processes the wet waste in a more efficient manner than traditional methods of grinding and pulping. Pilot programs are currently being developed by East Bay Municipal Utility District and UC Davis, with the expectation that it will become commercially feasible.

Food Scraps
Food scraps that cannot be donated, such as spoiled fruits and vegetables, stale bakery items, kitchen prep trimmings, and leftover plate scrapings, can be composted into a soil amendment, reducing the amount of organic material going into landfills. Restaurants, grocery stores, and schools can benefit from composting food scraps either on-site or at a compost facility. For areas that are served by waste management companies, composting food scraps could decrease refuse collection costs over the long-term, by reducing demand for landfill space and the volume of waste hauled.

Yard Waste
Yards produce waste from pruning, lawn mowing and other routine plant care. Composting reduces organic waste volume by approximately 50% to 75% and returns valuable nutrients to the soil that benefit growing plants. Organic matter improves drainage and aeration in clay soils. Compost acts as a separator that dissolves tightly packed clay particles to allow water and air to enter. Composting helps sandy soil hold water and nutrients. Compost retains moisture and releases fertilizer nutrients slowly. It also increases the activity of earthworms and other natural soil organisms beneficial to plant growth.

Current Efforts
Currently, the County offers backyard composting workshops and compost bins to unincorporated county residents upon request. Curbside greenwaste collection is also available in Willowbank and El Macero. Greenwaste collected in these areas is usually brought to a greenwaste facility adjacent to the county, where it is processed and used as a soil amendment for farming.

To support and augment these efforts, the County will expand the current residential and commercial organic material diversion outreach program. Through this program,

the County could provide instruction regarding how to separate organic materials prior to collection in new and existing unincorporated communities, and provide composting instructions and workshops for rural residents and businesses. The County may also consider an organic materials waste diversion ordinance requiring all household and commercial yard waste, food scraps, and food-soiled paper to be placed in organics carts or composted, where organic material collection and/or on-site composting is feasible or appropriate. The County may also consider an anaerobic digestion facility to compost organic and green waste at an industrial scale.

Reduce Disposal of Non-Organic Materials through Increased Recycling

Building on Ordinance No. 1378 (Ordinance Mandating Solid Waste Removal), Yolo County will consider establishing a per capita waste diversion target of 25% below 2003-2006 average waste disposal rates, which were approximately 1.22 tons of waste per capita per year, by 2020. This target translates to 0.92 tons of waste per capita per year in 2020 (the 2009 per capita waste disposal rate was 0.95 tons). Achieving this target will require full participation from residents and businesses, and collaboration with the cities. To achieve this target, the County and cities will update, as necessary, the Countywide Integrated Waste Management Plan that identifies strategies and actions that minimize waste in the unincorporated county over the next 10 years.

In the short-term, the County will review existing waste diversion programs, and the feasibility of continuing or expanding targeted outreach programs to increase participation in waste reduction and recycling programs. It may be necessary to adopt mandatory requirements, such as mandatory recycling for residences and businesses to ensure achievement of this important goal.

Increase Construction and Demolition Waste Diversion Standards

In 2008, the Yolo County Board of Supervisors adopted a Construction and Demolition (C&D) Ordinance (Ordinance No. 1375; Chapter 16, Title 6) that describes how construction, demolition, and renovation projects should dispose of their job site waste. This ordinance implements AB 939, which requires each local jurisdiction to divert 50% of discarded materials from the landfill. California Integrated Waste Management Board studies show that nearly 22% of waste disposed of in California is C&D debris. The County considers the reuse and recycling of C&D debris essential to further compliance with AB 939.

Projects that must comply with the ordinance include: (i) all construction of new buildings equal to or greater than 5,000 sq. ft.; (ii) multi-family dwellings; (iii) residential dwellings greater than 2,000 sq. ft. in a subdivision; (iv) all demolition projects equal to or greater than 1,500 sq. ft.; and (v) renovation of buildings that are equal to or greater than 1,000 sq. ft. The County will consider expanding the types of construction and demolition projects that must comply and increasing the minimum diversion rate from 50% to 65% for construction and demolition waste.

The increased diversion rate will increase recycling or reuse of wood, inert and vegetative materials, and metals. The County will also look at requiring construction and demolition projects to submit a plan to maximize reuse of building materials at the time of permit application. To ensure compliance, the County may conduct periodic construction and demolition waste audits.

Reduce Wastewater Treatment Emissions

Wastewater from domestic (municipal sewage) and industrial sources is treated to remove soluble organic matter, suspended solids, pathogenic organisms, and chemical contaminants. These treatment processes can produce methane emissions if organic constituents in the wastewater are treated anaerobically (i.e., without oxygen) and if the methane produced is released to the atmosphere. In addition, the sludge produced from some treatment processes may be further biodegraded under anaerobic conditions, resulting in methane emissions. These emissions can be avoided, however, by treating the wastewater and the associated sludge under aerobic conditions (i.e., with oxygen) or by capturing methane released under anaerobic conditions. Captured methane can be used to produce either hot water or electricity. The County will work with the special districts, cities, and tribal government that operate wastewater treatment facilities to obtain funding for and implement these improvements.

Increase Natural Stormwater Retention through Low Impact Development

Low Impact Development (LID) is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective impervious areas to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product. There are many methods to realize these principles, such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. By implementing

LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions. The County will review its Development Standards to incorporate LID standards as appropriate.

ADAPTATION

INTRODUCTION

Two types of responses to climate change are available: mitigation and adaptation. The previous sections of the CAP have primarily addressed mitigation, or reducing GHG emissions to help limit future human activity-induced climate change. This section will address adaptation, or preparing for and managing risk associated with climate change effects.

The introduction summarizes the climate change effects that Yolo County could expect, based on current science and understanding. There is a large scientific consensus about general categories of climate change effects and their likely consequences over continent-scale geography. However, understanding of the magnitude, timing and region-scale geographic effects and the interrelationships between these effects is still evolving. Thus, there is some uncertainty in the exact assessments that are provided in this section, although the concepts being laid out are widely accepted in the scientific community.

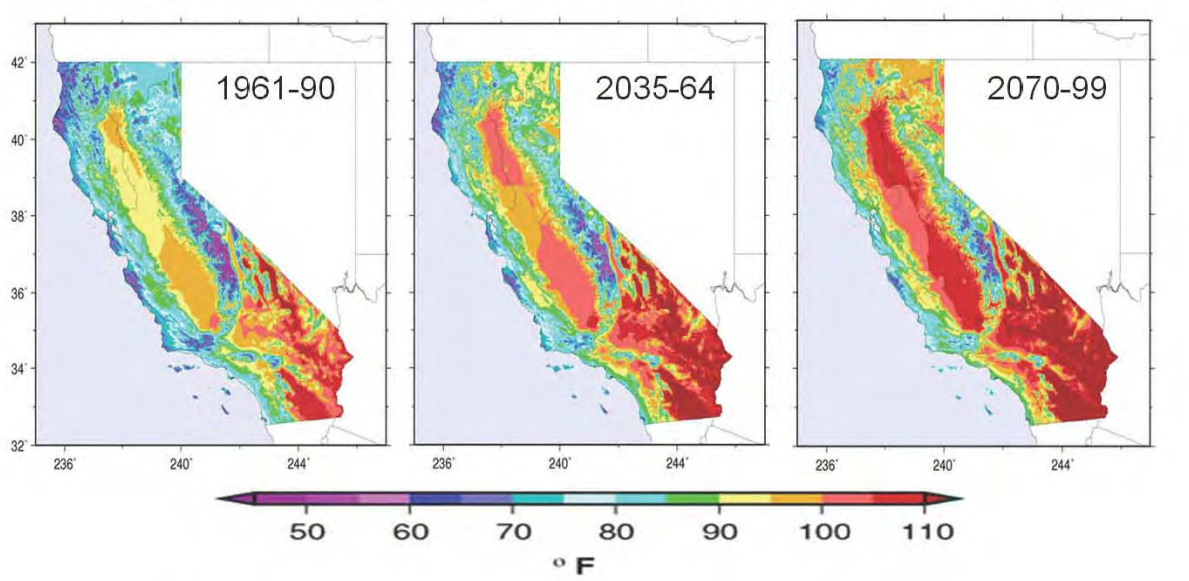


Figure 3-8: Average July Temperatures in California
Source: 2009 California Climate Adaptation Strategy

Following the introduction, the adaptation measures provide a basic framework for integrating climate change risk assessment and management into current planning processes, which culminates with a summary of an adaptation planning framework to help guide preparation for the effects of climate change in Yolo County. Where appropriate, the strategies also highlight mitigation measures for GHG

reduction in other sections of the CAP that also contribute to adaptation.

Climate Change Effects

Temperature
Increased concentrations of GHGs in the atmosphere result in increased air, surface, and ocean temperatures. Increased temperatures, in turn, drive most other climate change effects. Most regional climate model projections predict that annual average temperatures will increase in California during the next 100 years. The California Climate Action Team projects that temperatures in California will rise between 1.8° F and 5.4° F by mid century, and 3.6° F and 9° F by the end of the century (see Figure 3-8 for comparison of average July temperatures in the past and projected through the end of the 21st century). The exact level and timing of such a temperature increase in Yolo County is correspondingly uncertain.

Precipitation
Precipitation projections are more uncertain than those for temperature, because complex temporal variability is inherent in precipitation patterns. The International Panel on Climate Change (IPCC) predicts that increasing global surface temperatures are likely to result in changes in precipitation. Global climate models for a wide range of GHG emission scenarios also predict that average global precipitation will increase during the 21st century as a result of climate change. However, such models are generally not well-suited for predicting regional precipitation changes given that factors affecting precipitation vary by regional geography and meteorology. Thus, significant regional differences in precipitation trends are expected.

Some recent regional modeling efforts conducted for the western United States indicate that overall precipitation will increase, but considerable uncertainty remains. Projected precipitation increases are generally centered in Northern California in the winter months. However, various California climate models provide mixed results regarding changes in total annual precipitation in the State through the end of this century. One potential scenario of concern would be longer periods of drought punctuated by more intense storms during non-dr ought years. An IPCC review of multiple global models identifies much of California as an area where models generally did not agree on whether annual precipitation would increase or decrease; therefore, no firm conclusion on an increase or decrease can be provided, and the California climate could be either warmer-wetter or warmer-drier. Considerable uncertainties about the precise effects of climate change on California hydrology and water resources will remain until more precise and consistent information about how precipitation patterns, timing, and intensity will change is available. Given these uncertainties, regional conclusions regarding the potential effects of climate change on precipitation are speculative.

Yolo County must prepare for a future where competition for water resources between farming, cities, and the environment is greater than at the present time.

Water Supply
Several recent studies have shown that Yolo County's water supply systems are sensitive to climate change. However, experts are uncertain about what the overall effects will be on water supply.

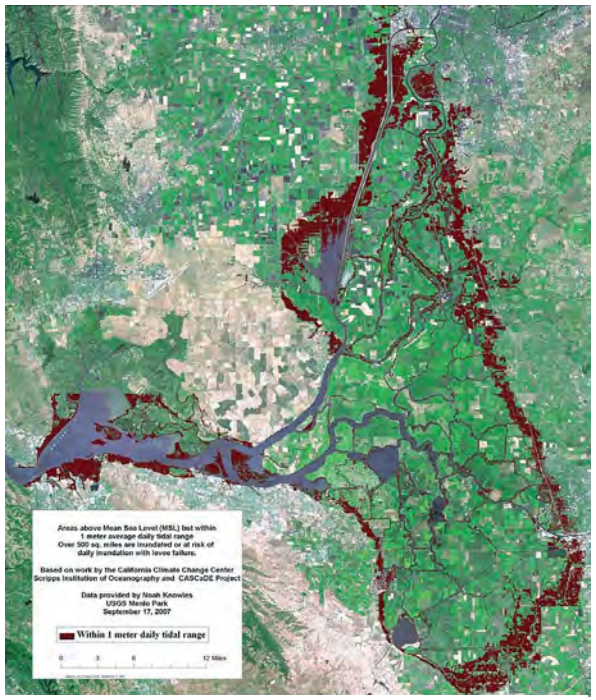


Figure 3-9: 1-meter Sea Level Rise Scenario in Yolo County
Source: Yolo County 2030 General Plan EIR

Some models indicate that drier conditions will cause decreased reservoir supplies and river flows. Other models predict wetter conditions with increased reservoir inflows and storage, and increased river flows.

Despite this uncertainty, it is still widely accepted that changes in water supply will occur and that water yields from reservoirs are expected to be unreliable. Yolo County must prepare for a future where competition for water resources between farming, cities, and the environment is greater than at the present time. Furthermore, climate change is also expected to result in more variable weather patterns, leading to longer and more severe droughts, which could lead to lower aquifer levels for those farmers dependent on groundwater.

Snowpack and Runoff
By delaying runoff during the winter months when precipitation is greatest, snow accumulation in the Sierra Nevada and Cascade Range to the east and the Coast Ranges and Klamath Mountains to the west of the Sacramento River acts as a massive natural reservoir for California. Snowpack typically accumulates from November though the end of March and melts from April through July. The length and timing of each year's snowpack accumulation and melting periods vary based on both temperature and precipitation.

Hydrologic models indicate that higher temperatures associated with global warming would affect the timing and magnitude of both snowmelt and runoff in Californa. Despite uncertainties surrounding climate change precipitation effects, there is very high confidence that higher temperatures will change both snowfall and snowmelt in many watersheds. This is particularly relevant to those areas in Yolo County that are dependent on the Sacramento River. These changes could diminish water supplies, increase flooding, and reduce summer soil moisture.

Sea Level Rise
Worldwide average sea level appears to have risen about 0.4 to 0.7 feet over the past century. Various tidal gauge stations along California's coast show a similar trend. Rising average sea level over the past century has primarily been attributed to warming oceans and related thermal expansion, and the addition of water from melting land-based glaciers and polar ice. Yolo County's location (more than 50 miles inland from the mouth of the Golden Gate) precludes significant effects from coastal processes, such as wave action. However, low-lying communities in or near the Delta, such as Clarksburg and Elkhorn (with elevation as low as five feet above sea level), would be more susceptible to flooding as sea level rise continues. Rising sea levels affecting the San Francisco Bay along the Napa, Solano, and Contra Costa County boarders may also worsen flooding in Yolo County and expand the county's floodplains. It is also possible that sea level rise could reduce the effectiveness of Delta and river levees within the county (reducing the levee freeboard and increasing levee stresses as a result of the rise in the base level of the adjacent water).

Heat-Related Illness
The most notable risk with heat waves is increased levels of heat stress and risk of health effects caused by extreme temperatures. This is particularly important for the elderly and infirm, as well as those with heart or respiratory problems and mental health issues. The percentage of Yolo County residents over the age of 65 was 9.6% in 2008. That number is expected to climb to 16.0% by 2030. With the prevalence of air-conditioner use during heat waves, demand for power could also increase putting more stress on power supply.

Air Quality
Throughout California, air quality is highly impaired compared to most of the nation. While predicting the effect of climate change on air quality is difficult due to complex physical, chemical, social, and policy variables, studies indicate that climate change could further worsen air quality throughout the State, including Yolo County. Higher temperatures may lead to increased ozone formation. Emissions of methane and nitrous oxide are projected to increase global ozone concentrations by 4% to 25% by 2100. If ozone levels rise to the high end of this range, attainment of ozone air quality standards could be impaired, which would have local effects in Yolo County. Highly air quality could result in increased incidence of respiratory disease and asthma.

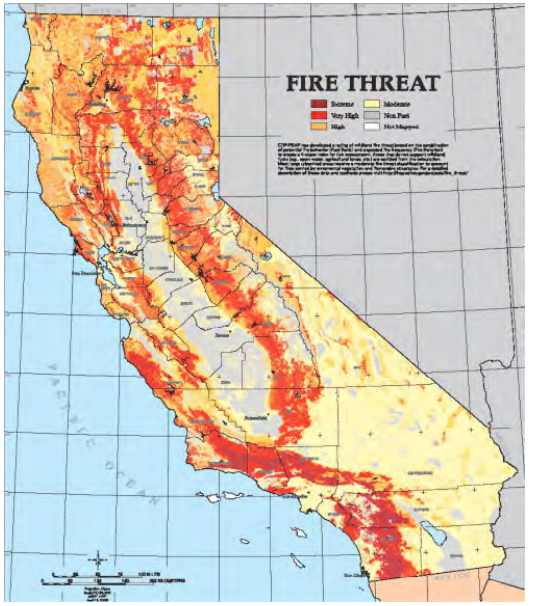


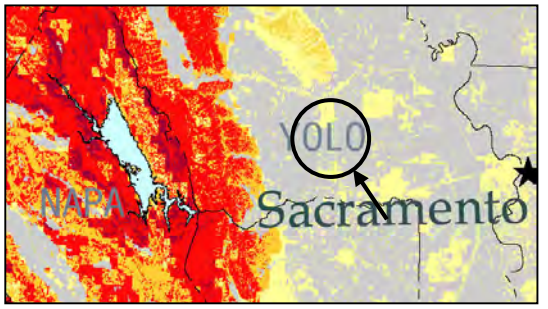
Figure 3-10: Fire Threat Zones in California and Yolo County
Source: 2009 California Climate Adaptation Strategy

Vector-borne Diseases
Temperature increases also could contribute to higher populations of mosquitoes and other disease-spreading organisms, or vectors. In California, three vector-borne diseases are of particular concern: human hantavirus cardiopulmonary syndrome, Lyme disease, and West Nile virus. Disease transmission, however, depends on additional factors such as the interaction of humidity and rainfall, the maturation cycles of both the vector and the pathogen, and human vector control activities. Yolo County's current low level of vector-borne disease is largely due to vector control measures. These measures would likely need to be enhanced and expanded, if vectors changed or risk of disease increased.

Wildfires
Warmer temperatures cause early runoff, which leads to longer and drier summer conditions, thus resulting in wildfires of greater frequency and duration. Hotter weather increases the incidence of lightning, which is the primary cause of wildfires in the United States. In addition, the increased prevalence of dry conditions provides greater opportunities for arson, which is another source of wildfire. As shown in Figure 3-10, much of the coast range hills of Yolo County are considered to have a moderate to high risk of wildfire.

Wildfire is a potentially significant risk to public health and safety. In addition to direct safety risks, wildfires can lead to immediate and long- term adverse public health problems due to smoke exposure. During wildfires, large populations can be exposed to a complex mixture of pollutant gases and particles, which can have both acute and chronic health effects. Smoke can irritate the eyes, harm the respiratory system, and worsen chronic heart and lung diseases, including asthma. People with existing cardiopulmonary diseases are generally at the greatest risk from smoke inhalation, with age being a complicating risk factor for the exposed population.

Extreme Weather Events
Climate change effects on weather patterns, storms, and extreme events in California are not well-understood at this time. Some models suggest increased variations in weather cycles and an increase in intense storms. Others point to increased potential for drought resulting from higher temperatures and evaporation with lower precipitation. Still others suggest that the west coast may have fewer extreme droughts than other areas while experiencing higher average annual rainfall. A separate study predicted higher risks of large storms and floods in California. These conflicting conclusions about climate variability and extreme weather events support the need for additional studies employing models that can provide region-scale predictions. Given uncertainties surrounding the type and extent of expected changes in climate variability and the speculative nature of predicting extreme weather events, effects of changing storm patterns and other extreme weather remain unclear.



Measure Description

Yolo County represents many of the attributes of agricultural landscapes throughout California's Central Valley: irrigated row crops on alluvial plains; upland grazed grasslands; small towns and cities; and a changing mixture of urban, suburban, and farming-based livelihoods through the past few decades. The choice of crops can vary annually depending on a complex variety of market, economic, weather, soil condition, and other factors. Yolo County has a climate that is slightly cooler and wetter than the more productive agricultural counties further south. The most important crops are tomatoes, alfalfa hay, wine grapes, and almonds, but a diversity of crops can be produced, which ultimately may increase resilience for future environmental changes, extreme events, and market competition.

The degree to which climate change will affect agriculture depends on a variety of factors. Potential effects include reductions in water supply and reliability, increased evapotranspiration, changes in growing season, and altered crop choices. Productivity and profitability may be negatively or positively affected by changes to the growing season and altered crop choices, depending on choices made by farmers. Overall, crops that may be hard-hit include wine grapes and fruit and nut trees. Yolo County's fruit and nut orchards covered approximately 24,006 acres in 2008, producing a wide variety of crops including almonds, apples, apricots, blackberries, blueberries, cherries, chestnuts, citrus fruit, figs, kiwis, nectarines, olives, peaches, pears, pecans, persimmons, pistachios, pomegranates, prunes, strawberries, table grapes, and walnuts.

Crop Vulnerabilities

The effects of climate change on crop vulnerability are complex with many interrelationships that still need to be better understood. While increases CO_2 and temperature could accelerate the life cycles of grain and oilseed crops, only small yield increases are expected. However, many crops are susceptible to heat waves particularly during flowering, and prolonged extreme temperatures can reduce plant growth and productivity.

Many of Yolo County's row crops are warm-season horticultural crops (e.g., tomato, cucumber, sweet corn, and pepper) with a temperature optimum of 68°F to 77°F for yield, and an acceptable range of 53.6°F to 86°F, with a maximum tolerance of 95°F. Mean mid-summer maximum temperatures already slightly exceed this, suggesting that 1.8° F and 5.4° F temperature increase by mid-century may force a shift to hot-season crops such as melon and sweet potato which have higher acceptable temperature ranges (64°F to 95°F). Warmer winter temperatures, however, would favor cool-season crops, such as lettuce and broccoli, that are now grown in winter/early spring further south, and which have an acceptable range of 41°F to 77°F.

For field crops such as corn and rice, temperature extremes exceeding 41°F-95°F, respectively, decrease pollen viability and pollen production, and reduce yields.

For corn, kernel development is reduced at temperatures greater than 86°F. Corn, but is less vulnerable to heat waves during the reproductive phase than grains such as wheat, barley, and rice.

Fruit trees require 200 to 1,200 hours of winter chill to flower. Chill hours are computed on a daily basis relative to a reference temperature. Using climate predictions for the Central Valley, winter chill hours will decrease from a baseline of 1,000 hours, as observed in 1950, to about 500 hours by 2100. Under most climate scenarios, the winter climate in Yolo County will approach the critical thresholds for yield for many fruit tree species by the end of the century.

Crop Water Needs

Farmers in Yolo County rely on groundwater for almost 40% of their supply in a normal water supply year, and this is expected to increase under possible future drought and population growth conditions. According to the California Department of Water Resources, rice, pasture, and hay have the highest applied water, and

evapotranspiration (ET) of applied water, and are therefore most vulnerable to water shortages. The effect of climate change on water supply is uncertain, and thus the effect of variations in the water supply on agriculture is not fully understood.

Both groundwater overdraft and water transfers contribute to uncertainty in the quantity and sometimes the quality of irrigation water for agriculture. Intermittent periods of dry years may not permit an easy rebound for irrigated crops, especially if groundwater is not available and affordable. Perennial crops are particularly vulnerable, but even growers of annual crops are also vulnerable, and may need to shift crops or set aside land. The prognosis of a drier Western United States suggests high vulnerability for crops that are abundant water users, especially if their cash value is low.

Pests and Disease
Pest and disease problems are difficult to predict, and assessments often do not account for potential yield losses due to changes in pest dynamics and density under climate change. Even a 3.6°F temperature rise can result in one to five additional generations per year for a range of invertebrates such as insects, mites and nematodes. Many insect species will expand their geographical range in a warmer climate.

Adaptation Strategies
According to the California Climate Change Center study *Potential for Adaptation to Climate Change in an Agricultural Landscape in the Central Valley of California*, potential adaptation responses by growers include changes in crop mix, irrigation methods, fertilization practices, tillage practices, and land management. CAP GHG reduction measures that also serve as adaptation strategies are noted in *italics*.

Crop mix. Growers may need to shift toward hot-season species, with greater winter potential for cool-season crops such as lettuce and broccoli. Additional crops or varieties may become more prevalent in Yolo County by mid-century, especially if advances are made in second generation biofuels, such as those producing cellulose useful as fuel. A shift to greater crop diversity will offset some of the risks from weather variation due to climate change.

Irrigation. If water supply becomes threatened, growers may need to shift towards drip irrigation and crops that provide higher income per amount of applied water. In addition to reducing water use, drip irrigation has been shown to reduce GHGs such as carbon dioxide and nitrous oxide compared to furrow irrigation, with no difference in yields for tomatoes, a major crop in Yolo County. However, it is not useful for all crops and entails substantial investment, labor, and energy for pressurization. *Supporting Agriculture Measure: Reduce Agricultural Water Use through Alternative Irrigation Techniques.*

Preparation
The critical function for the County will be to work with the University of California Cooperative Extension, Yolo County Resource Conservation District, and other agricultural organizations to develop outreach programs to inform and assist

farmers in adopting practices to adapt to the effects of climate change (e.g., temperature and precipitation variation).

Note: As commodity prices are dependent on global production and demand, any assessment of the effects of climate change on California agriculture must be done in the context of both regional and global changes in yields and commodity markets. The magnitude and direction of these yields will be determined by climatic factors such as temperature, precipitation, and weather variability, and production factors such as biotic responses to elevated atmospheric CO_2 concentrations, the availability and application of nutrients, and the ability of producers to adapt to these changes. Furthermore, as global markets develop for carbon trading, opportunities may arise for California agricultural producers to mitigate GHGs (for example, through sequestration, reduction in fuel use and vehicle emissions, or biofuel production). Therefore, adjustments in global food and mitigation markets together will significantly influence Yolo County agricultural producers' responses to climate change.

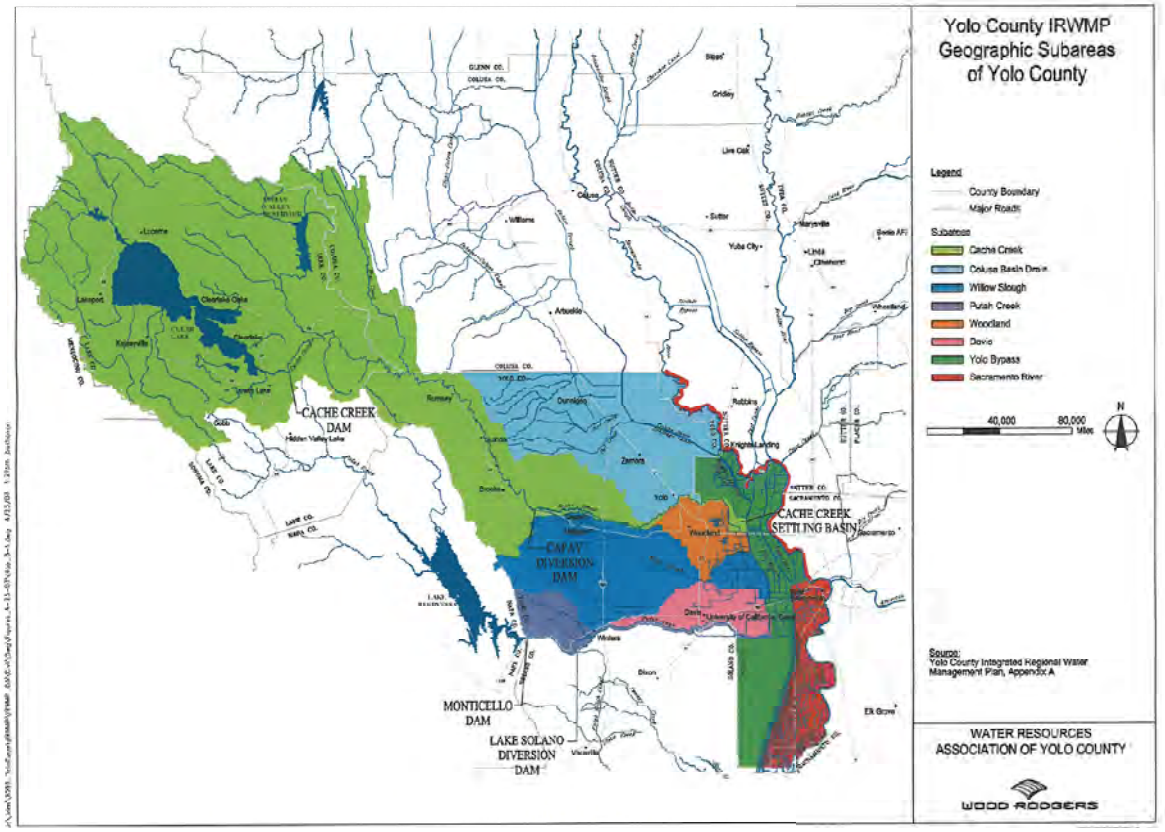
ACTION		RESPONSIBILITY	TIMEFRAME
A	Work with UC Cooperative Extension, Yolo County Resource Conservation District, and other agricultural organizations to develop outreach programs to inform and assist farmers in changing cropping patterns and/or practices to adapt to the effects of climate change (e.g., temperature and rainfall variation, etc.).	Planning & Public Works	Medium-Term
B	Develop a program to monitor and summarize relevant studies pertinent to climate change effects on agriculture and potential adaptation strategies, as a part of the monitoring report for the CAP.	Planning & Public Works	Medium-Term

PROGRESS INDICATORS		TARGET YEAR
A	Implement coordinated risk assessment and management effort and outreach program to help farmers prepare for climate change effects on agriculture.	2015

Measure Description

In the Integrated Regional Water Management Plan (IRWMP), the Water Resources Association of Yolo County (WRA) addressed such potential climate change effects as water supply and drought preparedness, variation in precipitation, water quality, flood management and storm drainage, and riparian and aquatic ecosystem enhancement. To prepare for climate change effects on water resources, this framework can be adapted to include increased variation in precipitation, changes in runoff patterns, changes in customer demand, and sea level rise effects on water supply and storage and distribution infrastructure.

Water supplies are most vulnerable to potential shifts in the timing of springtime runoff from the April-to-July period to winter months, and to decreases in annual runoff volumes. Water storage capacity would be moderately affected by shifts in seasonal runoff and increased customer demand, and very susceptible to decreases in annual precipitation volumes. To maximize



al Water Management Plan

supply reliability, the IRWMP should set in place plans to increase storage capacity and explore more diverse sources. These actions would provide flexibility and adaptability to unknown future conditions.

To prepare for these and other effects on water resources, the County will work with the WRA to update the IRWMP to monitor and respond to climate change effects on water resources. In particular, the update should focus on improving the compatibility of existing storm water and irrigation distribution systems with a groundwater banking program, to make the best use of extreme flooding and storm surges and variations in precipitation. CAP GHG reduction measures that also serve as adaptation strategies are noted in *italics* since they decrease the use of water for buildings and irrigated landscapes, conserving resources for other higher value uses.

Water Conservation: Implement best management practices for water use efficiency to reduce water and energy demand. *Measure E-6: Reduce Water Consumption in Existing Buildings through Increased Plumbing Efficiency; Measure E-7: Weather-based Irrigation and Water Efficient Turf Management; Energy Supporting Measure: Establish a Standard of No Net Increase In Water Demand For New Buildings.*

Water Reuse and Recycling: Expand water recycling and develop local water supplies that are more resilient to climate change. *Energy Supporting Measure: Promote Greywater and Rainwater Collection and Non-Potable Water Systems.*

ACTION		RESPONSIBILITY	TIMEFRAME
A	Work with the WRA to update the Integrated Regional Water Resource Management Plan to monitor and respond to climate change effects on water resources.	County Administrator WRA Planning & Public Works	Medium-Term

PROGRESS INDICATORS		TARGET YEAR
A	Update IRWMP with emphasis on summarizing and preparing for climate change effects on water supply.	2015

Measure Description

To prepare for the likely effects of sea level rise, Yolo County will coordinate with the Federal Emergency Management Agency (FEMA), Central Valley Flood Protection Board, and Department of Water Resources (DWR) to ensure that the flood mapping for potentially affected areas is regularly updated to reflect changes in Base Flood Elevations and to account for potential sea level rise. In addition, the County will ensure that sea level rise assessment and risk management processes are incorporated into the Yolo Operational Area Multi-Hazard Mitigation Plan (Action B in AD-5) and WRA's Integrated Regional Water Management Plan (Action A in AD-2). Furthermore, the County will work with the University of California – Davis, Yolo County cities, and neighboring counties to identify areas that will be affected by sea-level rise and institute protection and adaptation measures. Though Yolo County does not contain any areas adjacent to the coast or San Francisco Bay, it is still susceptible to flooding effects of sea level rise in the Delta. As part of the National Flood Insurance Program (NFIP) Community Rating System (CRS) program, the County will expand outreach to inform residents of potentially affected areas regarding the need to plan for sea level rise. The County will also work to revise capital improvement plans for roads, levees, and other critical infrastructure in potentially affected areas to address the effects of future sea level rise.

ACTION		RESPONSIBILITY	TIMEFRAME
A	Coordinate with the FEMA and DWR to ensure that the flood mapping for potentially affected areas is regularly updated to reflect changes in Base Flood Elevations accounting for sea level rise.	Planning & Public Works Office of Emergency Services (OES)	Medium-Term
B	As part of the National Flood Insurance Program (NFIP) Community Rating System (CRS) program, expand outreach to inform residents of potentially affected areas regarding the need to plan for sea level rise.	Planning & Public Works OES	Medium-Term
C	Work with the University of California – Davis and Yolo County cities to identify areas that will be affected by sea-level rise and institute protection and adaptation measures.	Planning & Public Works OES UC Davis	Medium-Term
D	Revise capital improvement plans for roads, levees, and other critical infrastructure in potentially affected areas to address the effects of future sea level rise.	Planning & Public Works OES	Medium-Term

PROGRESS INDICATORS		TARGET YEAR
A	Complete updates and collaboration efforts in Actions A-D.	2015

Measure Description

Climate change may affect human health in a variety of ways, including direct heat-related health effects and increases in air pollution and mosquito-borne diseases. To prepare for potential health threats, the County will update and revise the Yolo Operational Area Multi-Hazard Mitigation Plan and the Yolo County Office of Emergency Services Standardized Emergency Management System to address the public health risks associated with climate change, including vector-borne disease, heat-related illness and urban heat islands, air quality, wildfire, sea-level rise, and flooding, which are addressed in other measures within the Adaptation Strategy. GHG reduction measures that also serve as adaptation strategies are noted in *italics*.

Urban Heat Island Effect: Improve building envelopes and encourage the application of green roof or cool roof technology, to reduce the need to cool buildings in hot weather. *Measure E-1: Reduce Energy Consumption in Existing Residential and Non-Residential Buildings; Measure E-2: Reduce Energy Consumption in New Residential and Non-Residential Buildings.*

Air Quality: Encourage energy conservation, implement energy efficiency strategies and facilitate renewable energy installation to reduce pressure on the electrical grid during heat waves and drought conditions. *Measure E-1: Pursue a Community Choice Aggregation Program; Measure E-4: Increase Onsite Renewable Energy Generation; Measure E-5: Promote On-farm Renewable Energy Facilities.*

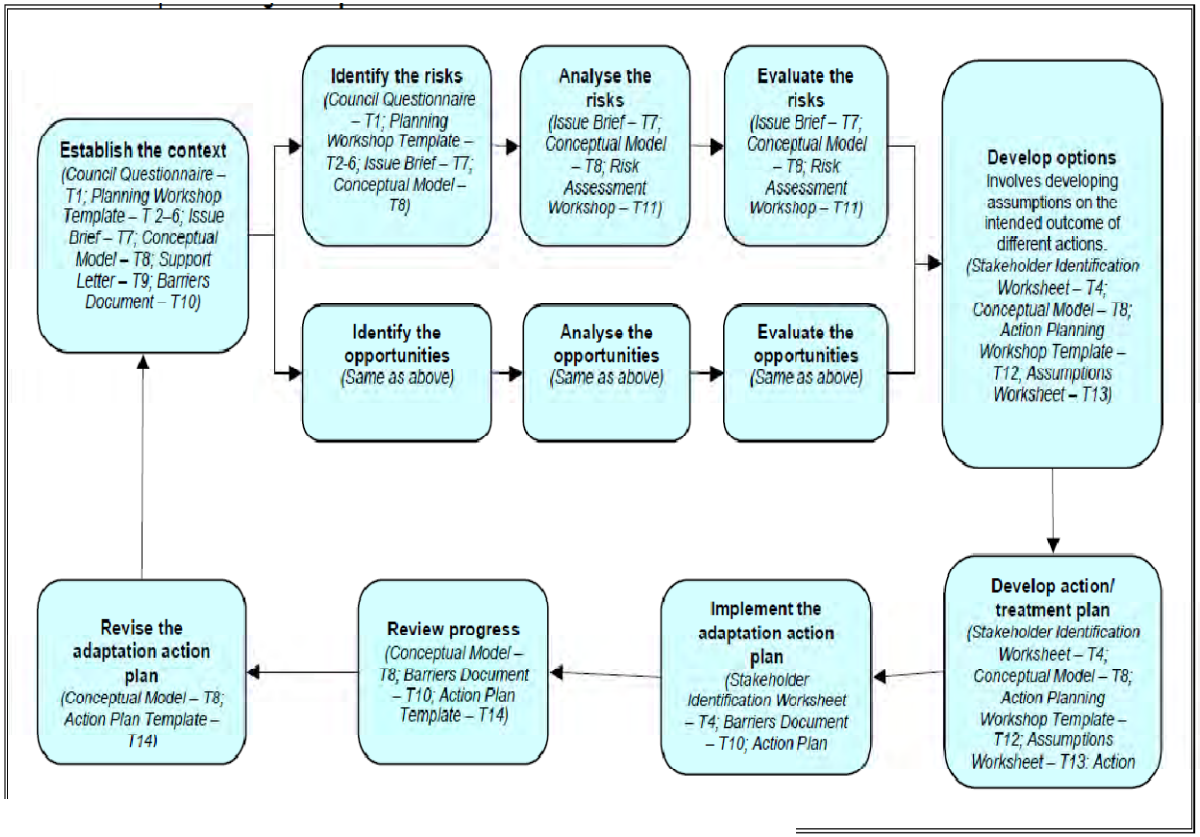
ACTION		RESPONSIBILITY	TIMEFRAME
A	Update and revise the Yolo Operational Area Multi-Hazard Mitigation Plan and the Yolo County Office of Emergency Services' Standardized Emergency Management System to address the public health risks associated with climate change.	Health Department Office of Emergency Services	Medium-Term

PROGRESS INDICATORS		TARGET YEAR
A	Update and revise the Yolo Operational Area Multi-Hazard Mitigation Plan and the Yolo County Office of Emergency Services' Standardized Emergency Management System.	2014

Measure Description

Preparing to adapt to the effects of climate change requires addressing governmental structures, processes, and priorities that influence land use, resource management, infrastructure investment, and many other decisions made by County government and other agencies. Climate adaptation requires strong institutional **processes** and clear decision-making frameworks to fully integrate the appropriate risk assessments into the County's long-term plans, investments, and operations. This integrated risk assessment or "adaptive management" approach is critical to identify action priorities that can be incorporated into existing plans.

The following steps were developed and presented in ICLEI's *Local Government Climate Change Adaptation Toolkit*, and can be used as a guide for updating the County's Multi-Hazard Risk Mitigation Plan, Integrated Regional Water Management Plan, the Yolo County Office of Emergency Services' Standardized Emergency Management System, and the Yolo County General Plan:



1) Establish the context – Define the objectives of the adaptive management process, identify stakeholders, establish success metrics, and identify climate change issues (i.e., temperature increase, precipitation volatility, water scarcity, sea level rise, flooding, wildfires, extreme weather events, heat-related illness, and air quality) as identified in this document.

2) Identify risks and opportunities – Examine the climate change issues facing Yolo County to identify potential risks and opportunities. This has been accomplished in part within the current Yolo Operational Area Multi-Hazard Mitigation Plan, and should include consideration of climate change scenarios developed by the California Climate Change Center and Climate Action Team (CAT), the California Natural Resources Agency, and the Pacific Council on International Policy.

3) Analyze risks and opportunities – Examine existing risk management practices employed within the Yolo Operational Area Multi-Hazard Mitigation Plan, the Integrated Regional Water Management Plan, and the Yolo County General Plan. This step involves consulting the California Natural Resources Agency, Office of Emergency Services (OEM), Department of Fish and Game, Department of Conservation, and Department of Food and Agriculture to obtain information regarding identified risks and opportunities.

4) Evaluate risks and opportunities – Evaluate the likelihood and consequence of identified risks and opportunities and establishing priorities.

5) Develop options – Examine priority risks and opportunities and develop assumptions regarding factors that would mitigate risks. Identify direct and indirect control over risks, as well as the effects of particular risk reduction actions.

6) Develop risk assessment and management updates to current plans – Develop updates to reduce risks and harness opportunities in, at minimum, the following plans: the Yolo Operational Area Multi-Hazard Mitigation Plan, the Integrated Regional Water Management Plan, and the Yolo County General Plan.

7) Implement the adaptation action plan – Implement the actions according to the schedule set out in plan updates.

8) Review progress – Monitor progress throughout implementation and review sections of the plan updates.

9) Revise the adaptation plan updates – Prepare progress reviews and additional plan revisions, and revisit key assumptions, as needed. This process should become a cycle. The priority of risks and opportunities may change over time, so institutionalizing this process will help ensure that the County and other agencies are prepared to implement effective climate adaptation actions.

ACTION		RESPONSIBILITY	TIMEFRAME
A	As a part of the biennial report to the Board of Supervisors regarding implementation of the CAP, provide an update on climate change adaptation science, policy, and legislation at the state, regional, and local level to guide future revisions.	Planning & Public Works	Short-Term
B	Update the Yolo Operational Area Multi-Hazard Mitigation Plan with an emphasis on assessing climate change related effects and risks in Yolo County and developing adaptation measures and processes.	Planning & Public Works	Medium-Term
C	Consult and coordinate with the California Natural Resources Agency, OES, Department of Fish and Game, Department of Conservation, and Department of Food and Agriculture regarding development of climate adaptation priorities.	Planning & Public Works	Medium-Term
D	Collaborate with researchers at the UC – Davis regarding regional climate data monitoring and risk modeling.	Planning & Public Works	Medium-Term

PROGRESS INDICATORS		TARGET YEAR
A	Maintain a summary of current state-of-the-art climate adaptation science, policy, and legislation at the state, regional, and local level, to be updated biennially for the CAP update report to the Board of Supervisors.	2013
B	Update the Yolo Operational Area Multi-Hazard Mitigation Plan.	2014

4 Implementation and Benchmarks

INTRODUCTION

Yolo County acknowledges that climate change is an important global challenge. This Climate Action Plan (CAP) implements the Yolo County General Plan by identifying the County's efforts as one step toward addressing this issue. To achieve the greenhouse gas (GHG) reductions described in this CAP, the vision and guidance provided must be translated into actions that result in positive effects which can be measured. This chapter describes how the County will implement CAP measures, and consists of the following four sections:

- Measure Implementation- This section discusses how County staff will implement the CAP measures and actions, and the role of progress indicators and timeframes.
- Plan Evaluation and Evolution- This section describes the need to evaluate, update, and amend the CAP over time to ensure that the plan remains effective and current.
- Funding Sources and Financing- This section generally describes funding sources, strategies, and financing available to implement CAP measures and actions.
- Relationship to the California Environmental Quality Act- This section describes the relationship between the CAP and the California Environmental Quality Act, and documents the County's reliance on the General Plan EIR to provide clearance for GHG emissions for all projects consistent with the General Plan and the CAP.

MEASURE IMPLEMENTATION

Ensuring that the measures translate to on-the-ground results is critical to the success of the CAP. To facilitate this, each measure described in Chapter 3 contains a table identifying specific actions the County will implement. The table also identifies responsible departments and establishes an implementation timeframe for each action.

The second section of each table provides performance targets for both 2020 and 2030 that enable staff, the Board of Supervisors, and the public to track measure implementation and monitor overall CAP progress. These indicators are suitable benchmarks to monitor implementation progress and evaluate if a measure is achieving the necessary GHG reductions. Table 4-1 provides a summary of this information for easy reference. The list also indicates whether the measure is mandatory or voluntary, and if the measure applies to new or existing development, or both.

Identified County departments will be responsible for implementing assigned actions upon adoption of the CAP. Key staff in each department will facilitate and oversee action implementation. CAP implementation meetings will occur regularly to assess the status of County efforts. Some actions will require inter-departmental or inter-agency cooperation and appropriate partnerships will need to be established accordingly.

TABLE 4-1: SUMMARY OF CAP PERFORMANCE INDICATORS

Measure Number and Title		Performance Indicators	Responsibility	Timeframe	Mandatory (M) or Voluntary (V)	New (N) and/or Existing (E) Development
A-1 Reduce nitrogen fertilizer application rates	A	Average nitrogen fertilizer application rates reduced by 6% below current (2008) levels.	Agricultural Commissioner	2020	V	E
	B	Average nitrogen fertilizer application rates reduced by 15% below current (2008) levels.		2030	V	E
A-2 Reduce fossil fuel consumption in field equipment	A	Fuel efficiency improved by 6% in 5% of farm equipment through operation and maintenance improvements.	Agricultural Commissioner	2030	V	E
	B	Fuel efficiency improved by 5% in 25% of farm equipment through improvements to equipment (e,g., conversion to Tier IV engines or better).		2020	V	E
	C	Fuel efficiency improved by 5% in 75% of farm equipment through improvements to equipment (e,g., conversion to Tier IV engines or better).		2030	V	E

TABLE 4-1: SUMMARY OF CAP PERFORMANCE INDICATORS

Measure Number and Title		Performance Indicators	Responsibility	Timeframe	Mandatory (M) or Voluntary (V)	New (N) and/or Existing (E) Development
A-3 Reduce energy use in agricultural irrigation pumping	A	40% of tailwater-return pumps switched to solar electric energy source providing 50% of pumping energy.	**Planning and Public Works Department** **Agricultural Commissioner**	**2020**	**V**	**E**
	B	90% of tailwater- return pumps switched to solar electric energy source providing 50% of pumping energy.		**2030**	**V**	**E**
	C	10% of groundwater pumps improve pump bowl efficiency for an average 33% reduction in energy (electricity or diesel) consumed.		**2020 & 2030**	**V**	**E**
A-4 Reduce confined livestock manure methane emissions	A	Reduction of 90% manure methane emissions from 100% of confined livestock operations.	**Agricultural Commissioner**	**2020**	**V**	**E**
A-5 Reduce methyl bromide application	A	100% reduction in methyl bromide application.	**NA**	**2020 & 2030**	**M**	**E**
A-6 Sequester carbon in	A	1,100 acres of riparian forest restored by 2020. 2,000 acres restored by 2030.	**Agricultural Commissioner**	**2020 & 2030**	**M**	**N**

TABLE 4-1: SUMMARY OF CAP PERFORMANCE INDICATORS

Measure Number and Title		Performance Indicators	Responsibility	Timeframe	Mandatory (M) or Voluntary (V)	New (N) and/or Existing (E) Development
agricultural landscapes	B	50 miles of new hedgerow established by 2020 and 100 miles established by 2030.	Planning and Public Works Department	2020 & 2030	M	N
	C	New orchards established by 2020 (537 acres almonds, 446 acres walnuts, 1,340 acres olives).		2020	V	N
		New orchards established by 2030 (1,146 acres almonds, 891 acres walnuts, 2,860 acres olives).		2030	V	N
T-1 Reduce Vehicle Miles Traveled in New Development	A	100% of Dunnigan, 60% of Madison, 50% of Esparto, 33% of Elkhorn, and 25% of Knights Landing achieve VMT performance standards.	Planning and Public Works Department	2020 & 2030	M	N
E-1 Pursue a community choice aggregation program	A	Develop a CCA feasibility study and identify partner jurisdictions.	County Administrator	2012	M	NA
	B	Develop a business plan and implementation strategy for the CCA.		2015	M	NA
	C	50% of consumers purchase "light green" portfolio comprised of 50% renewable sources; 25% of		2020	M	E, N

TABLE 4-1: SUMMARY OF CAP PERFORMANCE INDICATORS

Measure Number and Title		Performance Indicators	Responsibility	Timeframe	Mandatory (M) or Voluntary (V)	New (N) and/or Existing (E) Development
		consumers purchase "deep green" portfolio comprised of 100% renewable sources; 25% of consumers stay with PG&E portfolio.				
	D	75% of consumers purchase "light green" portfolio comprised of 50% renewable sources; 25% of consumers purchase "deep green" portfolio comprised of 100% renewable sources.		2030	M	E, N
E-2 Reduce energy consumption in existing residential and non-residential buildings	A	20% of residential units complete an energy efficiency retrofit, with an average energy efficiency improvement of 15%.	**County Administrator** **Planning and Public Works Department**	2020	V	E
	B	10% of non-residential buildings complete an energy efficiency retrofit, with an average energy efficiency improvement of 20%.		2020	V	E
	C	70% of residential units complete an energy efficiency retrofit, with an average energy efficiency improvement of 15%.		2030	V	E
	D	30% of non-residential buildings complete an energy efficiency retrofit, with an average energy efficiency improvement of 20%.		2030	V	E

TABLE 4-1: SUMMARY OF CAP PERFORMANCE INDICATORS

Measure Number and Title		Performance Indicators	Responsibility	Timeframe	Mandatory (M) or Voluntary (V)	New (N) and/or Existing (E) Development
E-3 Reduce energy consumption in new residential and non-residential buildings	**A**	97.5% of new buildings (residential over 3,500 square feet of livable space [excluding affordable housing] and non-residential [after 2013]) achieve Tier 1 energy performance.	**Planning and Public Works Department**	**2020**	**M**	**N**
	B	2% of new buildings (residential and non-residential) achieve exemplary performance (Tier 2) and 0.5% of new buildings achieve zero-net energy demand.		**2020**	**V**	**N**
	C	86% of new buildings (residential over 3,500 square feet of livable space [excluding affordable housing] and non-residential [after 2013]) achieve Tier 1 energy performance.		**2030**	**M**	**N**
	D	12% of new buildings (residential and non-residential) achieve exemplary performance (Tier 2) and 2% of new buildings achieve zero-net energy demand.		**2030**	**V**	**N**
E-4 Increase on-site renewable energy generation to reduce demand for grid energy	**A**	Complete County Code amendments.	**County Administrator** **Planning and Public Works Department**	**2012**	**M**	**N**
	B	90% of new (excluding affordable housing) and 15% of existing residential units and 100% of new and 5% of		**2020**	**M (new)** **V (existing)**	**E, N**

TABLE 4-1: SUMMARY OF CAP PERFORMANCE INDICATORS

Measure Number and Title		Performance Indicators	Responsibility	Timeframe	Mandatory (M) or Voluntary (V)	New (N) and/or Existing (E) Development
		existing commercial buildings (after 2013) install solar hot water heaters.				
	C	90% of new (excluding affordable housing) and 5% of existing residential units and 100% of new commercial buildings (after 2013) and 200,000 square feet of existing commercial rooftop space installs solar PV.		2020	M (new) V (existing)	E, N
	D	100% of new (excluding affordable housing) and 40% of existing residential and 100% of new (after 2013) and 10% of existing commercial buildings install solar hot water heaters.		2030	M (new) V (existing)	E, N
	E	100% of new (excluding affordable housing) and 10% of existing residential and 100% of new commercial (after 2013) and 300,000 square feet of existing commercial rooftops install solar PV.		2030	M (new) V (existing)	E, N
E-5 Promote on-farm	A	Identify funding sources to finance investments in renewable energy for agricultural operations.	Agricultural Commissioner	2012	V	NA

TABLE 4-1: SUMMARY OF CAP PERFORMANCE INDICATORS

Measure Number and Title		Performance Indicators	Responsibility	Timeframe	Mandatory (M) or Voluntary (V)	New (N) and/or Existing (E) Development
renewable energy facilities	B	Develop a farmer-to-farmer workshop program.	County Administrator	2014	V	E
	C	Identify funding sources to finance investments in renewable energy for agricultural operations.		2012	V	E
	D	1-MW of renewable energy generated on farms in the unincorporated County (excluding solar water pumps).		2020	V	E
	E	2-MW of renewable energy generated on farms in the unincorporated County (excluding solar water pumps).		2030	V	E
E-6 Reduce water consumption in existing buildings through increased plumbing fixture	A	100% of residential units built prior to 1994 improve fixture and fixture fitting water efficiency by 15%.	County Administrator Planning and Public Works Department	2020	M	E
	B	40% of existing residential units and commercial buildings reduce water consumption by 6% through water leak repair.		2020	V	E

The County will evaluate plan performance over time and make recommendations to alter or amend the plan if it is not achieving the proposed reduction targets.

TABLE 4-1: SUMMARY OF CAP PERFORMANCE INDICATORS

Measure Number and Title		Performance Indicators	Responsibility	Timeframe	Mandatory (M) or Voluntary (V)	New (N) and/or Existing (E) Development
efficiency	C	100% of residential units built prior to 1994 improve fixture and fixture fitting water efficiency by 20%.		2030	M	E
E-7 Promote weather-based irrigation systems and water efficient turf management	A	Complete County Code amendments.	Planning and Public Works Department	2012	M	N
	B	2% of residential (single-family and multi-family) units reduce landscape water consumption by 20%.		2020	V	E
	C	5% of commercial buildings reduce landscape water consumption by 20%.		2020	V	E
	D	25% of residential (single-family and multi-family) units reduce landscape water consumption by 20%.		2030	V	E
	E	50% of commercial buildings reduce landscape water consumption by 20%.		2030	V	E
WR-1 Expand landfill methane capture systems	A	Achieve 90% methane capture (control efficiency) at the Yolo County Central Landfill.	Integrated Waste Management	2020	M	E

Note: All figures listed in this table are inclusive, not exclusive. In other words, figures for 2030 include figures for 2020 and are not in addition to the 2020 figures.

PLAN EVALUATION AND EVOLUTION

The CAP represents the County's best efforts to address the threat of global climate change through a well organized and comprehensive response within the unincorporated County. The CAP lays out a broad-based strategy to significantly reduce GHGs and improve sustainability. County staff will evaluate plan performance over time and make recommendations to alter or amend the plan if it is not achieving the proposed reduction targets.

Plan Evaluation

There are two important types of performance evaluation: evaluation of the CAP as a whole and evaluation of the individual measures. Subsequent communitywide GHG emission inventories provide the best indication of CAP effectiveness, and will allow actual growth to be reconciled with growth projected by the General Plan and CAP. Conducting periodic inventories will allow comparison to the 1990 baseline and will demonstrate the CAP's ability to achieve proposed reduction targets.

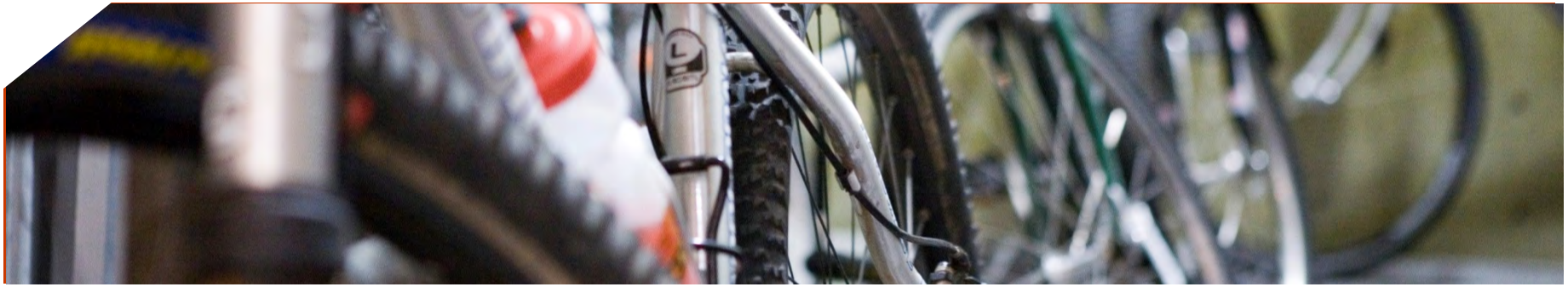
The Planning Division will coordinate community inventories every three to five years beginning in 2015 to measure performance and progress towards achieving emission reduction targets.

While inventories provide information about overall emission reductions, it is also important to understand the efficacy of individual measures. Evaluating the emission reduction capacity, cost, and benefit of individual measures improves County staff and decision makers' ability to manage and implement the CAP.

Evaluating CAP measure performance requires monitoring the level of community participation and the GHG reduction capacity. The progress indicators, provided within each quantified measure, indentify the level of participation and performance required to achieve the estimated level of GHG reduction. By evaluating whether the implementation of a measure is on track to achieve its progress indicators, the County can identify successful measures and reevaluate or replace under-performing ones.

CEQA Guidelines Section 15183.5(b)(1)(E) requires that the County amend the CAP if it finds that the plan is not achieving the adopted GHG reduction target. The Planning and Public Works Department will evaluate measures every two years beginning in 2013, and will summarize progress toward meeting the GHG reduction target at that time in a report to the Board of Supervisors that describes:

- Estimated annual GHG reductions (compared to 1990, 2008, and subsequent inventory years)
- Achievement of progress indicators
- Participation rates (where applicable)
- Implementation costs
- Community benefits realized
- Remaining barriers to implementation
- Recommendations for changes to the CAP



In addition to the biennial review of the CAP's progress, the GHG inventory will be updated every five years beginning in 2015.

Plan Evolution

The County will amend the General Plan to incorporate key components of this CAP and its measures and actions by reference. The CAP must be flexible to evolve over time and remain relevant as new information on climate change science and risk emerges, new GHG reduction technologies and innovative strategies are developed, new financing options are created, and state and federal legislation advances. By adopting the CAP as a stand-alone implementation document, it will retain the flexibility needed to respond to changing circumstances.

It is also possible that subsequent inventories will indicate that unincorporated Yolo County is not achieving established reduction targets. As part of the evaluations identified above, the County will assess the implications of new findings in the field of climate change, explore new opportunities

Climate Action Plan Monitoring and Evaluation Schedule

2011 — **Climate Action Plan Adopted**
Board of Supervisors adopts plan and staff begins to implement CAP measures.

2013 — **Measure Status Review**
Planning Division reviews measure performance, provides an initial review of the status of implementation, and prepares report for presentation to the Board.

2015 — **Emission Inventory / Measure Status Review/ Plan Evaluation**
Planning Division conducts inventory of community emissions, reviews measure performance, provides an initial review of the status of implementation, makes recommended changes to the CAP should measures prove infeasible, and prepares report for presentation to Board. The report will identify ways to adapt the plan to maintain the desired reduction path.

2017, 2019 — **Measure Status Reviews**
Planning Division reviews measure performance, provides an initial review of the status of implementation, and prepares report for presentation to the Board.

2021 — **Target Year Report**
Prepare inventory and measure status review for 2020 and develop Target Year Report for presentation to Board and State agencies that summarizes achievements to date and provides recommendations for the next 10 years.

2020+ — Repeat the above process for 2020 -2030. Develop appropriate actions to meet 2040 and 2050 GHG reduction goals.

for emissions reduction and climate adaptation, respond to changes in climate legislation, and incorporate relevant changes to ensure an effective and efficient CAP.

FUNDING SOURCES AND FINANCING MECHANISMS

This section describes potential funding sources and financing mechanisms that Yolo County could pursue to offset the financial burden of implementing the CAP measures described in Part 2. Each measure is accompanied by information regarding potential funding sources, financing strategies, and partnership opportunities.

The spectrum of public and private funding options for the measures outlined in this CAP is ever-evolving. This section outlines current (2010) funding options, but these could quickly become out of date. However, there are general sources of funding that provide the most up-to-date information, including:

- U. S. Department of Energy Environmental Protection Agency
- US Department of Housing and Urban Development
- California Energy Commission California Infrastructure and Economic Development Bank
- Sacramento Area Council of Governments
- Pacific Gas & Electric
- Water Districts: Dunnigan Water District, Knights Landing Ridge Drainage District, Yolo County Flood Control & Water Conservation District, and Yolo-Zamora Water District
- Water Resouces Association of Yolo County
- Yolo-Solano Air Quality Management District

Costs and Savings

In addition to the cost for the County to implement the CAP, there will be private costs borne by residents, businesses, and farmers to comply with its requirements. In recognition of this, a costs and savings analysis was performed for selected, high impact measures to evaluate the potential costs and savings to residents, businesses, or farmers, as applicable. This analysis was summarized in Chapter 3, and analytical background information is provided in Appendix E. However, there are also costs that the County will bear that were not assessed as part of the CAP. Generally, the implementation costs to the County for the creation of programs, which consist primarily of initial start-up costs and ongoing administration and enforcement costs, range considerably from negligible to several hundred thousand dollars.

Measures also vary in the distribution of costs. Some measures require only funding from the County or other public entities, whereas others will result in increased costs for residents, businesses, and farmers. In nearly all measures that require some investment by residents, business owners, or farmers, there are substantial long-term savings that will allow recuperation of initial investments. Many measures can be paid for through various government programs and require no private investment, but will generate savings for the resident, business owner, or farmer.

The County will pursue a variety of funding strategies including federal, State, and regional grants and partnerships with Yolo County cities, jurisdictions agencies, and businesses.

Funding Strategy

The CAP will require strategic public funding by the County, regional government agencies, and the State for capital projects, incentives, outreach/education, and new regulations necessary to achieve the plan's objectives. To decrease costs and improve the plan's efficiency, actions should be pursued concurrently whenever possible. For example, the County will pursue land use and transportation-related actions together during development of specific plans. The County will also look to address water- and waste-related measures with the related utilities and agencies (e.g., WRA, Water Districts, and Yolo County Integrated Waste Management Division). Also, the County will need to partner with various agricultural extension and research organizations in the area to reach out to the agricultural community to implement some CAP measures. Inter-organization collaboration will be paramount to successful implementation of the CAP.

Specific funding sources and financing mechanisms have not been identified for all measures; however, numerous federal, State, and regional grants are available to provide funding. Which funding sources the County decides to pursue and which financing mechanisms the County develops and administers will be addressed through more detailed implementation. Additional detail on these and other programs follows in the subsequent sections.

Additionally, the County should partner with Yolo County cities and jurisdictions to administer joint programs when feasible. As many businesses in the greater Sacramento region are leaders in resource efficiency, renewable energy, and green infrastructure, potential opportunities exist to partner with the private sector to decrease implementation costs. Finally, many of the measures and actions have the potential to be self-financing if properly designed and implemented.

ENERGY INCENTIVE PROGRAMS

Many of the financing and incentive programs related to the CAP concern energy infrastructure and conservation. Some of these programs are tied to the American Recovery and Reinvestment Act (ARRA) economic stimulus package enacted by Congress in February 2009. Access to these funds will be available for a limited period, and the County should seek the most up-to-date information regarding the programs listed below.

Energy Upgrade California

www.energyupgradecalifornia.com/

Energy Upgrade California is part of the State Energy Program (SEP), which is administered by the Calfiornia Energy Commission. The purpose of the program is to create jobs and stimulate the economy through promoting energy retrofits in existing residential buildings. The retrofit program is designed to:

- Establish sets of verifiable retrofit standards for energy efficiency and other green improvements that are easy for building owners and contractors to understand
- Train contractors to implement these standards in their retrofit projects

- Create quality assurance procedures to help ensure that retrofit work meets program requirements and performance expectations
- Offer financing for eligible improvements through CaliforniaFIRST
- Bundle potential rebates and other incentives to make them more accessible to property owners
- Conduct a countywide marketing and public outreach campaign to get the word out to property owners and building industry contractors about best practices for energy efficiency and green retrofits, as well as financing and incentives.

Flex Your Power

www.fypower.org

Initiated in 2001, Flex Your Power is a partnership of California's utilities, residents, businesses, institutions, government agencies and nonprofit organizations working to save energy. The campaign includes a comprehensive website, an electronic newsletter and blog, and educational materials. The website provides regularly updated information on financial incentives and technical assistance for energy-efficient appliances, equipment, lighting and buildings. This information is available to residential, commercial, industrial and institutional consumers.

As existing programs evolve and new programs are created, Flex Your Power is a useful clearinghouse for information. Current incentives relevant to Yolo County include:

- The Enhanced Automation Initiative (EAI) pays large commercial and institutional customers to improve energy efficiency of existing building automation systems or energy management systems.
- PG&E's Savings by Design program provides design assistance and financial incentives to commercial, industrial, institutional and agricultural building owners and design teams to promote energy efficient design and construction practices.

California Solar Initiative

www.gosolarcalifornia.org/csi/index.php

The California Solar Initiative (CSI) is the solar rebate program for California consumers who are customers of investor-owned utilities, such as PG&E. The CSI Program pays solar consumers an incentive based on system performance. This program funds both solar photovoltaics (PV), as well as other solar thermal generating technologies for existing homes, and existing or new commercial, agricultural, government, and non-profit buildings. This program also funds solar hot water systems. An additional rebate is available for single-family homes owned by low-income residents or multi-family affordable housing.

The CSI solar incentives differ by customer segment and size, and are intended to encourage high performing systems. Two types of incentives are available through the CSI program: Expected Performance-Based Buydown (EPBB) and Performance-based Incentives (PBI). EPBB is a one time, up-front payment based on an estimate of the system's future performance. For solar projects with a system larger than 30-kW, PBI are monthly payments for five years based on actual performance (output) of

The California Energy Commission offers low-interest loans for public institutions to finance energy-efficient projects that have proven energy or capacity savings.

the system. The incentive rate is based on the incentive type—EPBB or PBI, and the relevant customer segment—residential, commercial or government/non-profit.

The CSI solar thermal hot water program will run for eight years, ending on December 31, 2017.

California Feed-In Tariff

www.cpuc.ca.gov/PUC/energy/Renewables/hot/feedintariffs.htm

The California feed-in tariff allows eligible customer-generators to enter into 10-, 15- or 20-year standard contracts with their utilities to sell the electricity produced by small renewable energy systems -- up to 3 megawatts (MW) -- at time-differentiated market-based prices. Time-of-use adjustments will be applied by each utility and will reflect the increased value of the electricity to the utility during peak periods and its lesser value during off-peak periods. These tariffs are not available for facilities that have participated in the CSI program, Self-Generation Incentive Program (SGIP), Renewables Portfolio Standard, or other ratepayer funded generation incentive programs, including net-metering tariffs.

For customers generating renewable energy not covered by the CSI or SGIP (e.g., biomass or geothermal) the feed-in tariff is applicable. If customers prefer a long-term contract at a fixed price over a financial incentive paid in the short term, feed-in tariffs may be a beneficial financing tool.

Property Assessed Clean Energy

www1.eere.energy.gov/wip/solutioncenter/financialproducts/pace.html

A property-assessed clean energy (PACE) finance program is enabled through the AB 811 legislation[1]. A PACE program permits property owners within participating jurisdictions (including Yolo County) to finance the installation of energy and water improvements within their home or business and pay back the amount as a line item on their property tax bill. This bill allows land-secured loans for homeowners and businesses who install energy-efficiency projects and clean-energy generation systems to be paid back through assessments on individual property tax bills. If the property is sold, the outstanding loan balance is taken over by the new owner, allowing property owners to avoid up-front installation costs, while at the same time requiring little or no investment of local government general funds.

Recent legislation, AB 474, expanded the program's reach to include the financing of water efficiency projects. Eligible projects under a PACE program may include, but are not limited to: air sealing, wall and roof insulation, energy-efficient windows, tankless water heaters, solar photovoltaics, and low-flow toilets.

California Energy Commission Energy Efficiency Financing

www.energy.ca.gov/efficiency/financing/index.html

The California Energy Commission offers low-interest loans for public institutions to finance energy-efficient projects. Projects

[1] At the time of writing, the PACE program is being litigated in federal court.

with proven energy and/or capacity savings are eligible, provided they meet the eligibility requirements. Examples of projects include:

- Lighting systems
- Pumps and motors
- LED streetlights and traffic signals
- Automated energy management systems/controls
- Building insulation
- Renewable energy generation and combined heat and power projects
- Heating and air conditioning modifications
- Waste water treatment equipment

Loans for energy projects must be repaid from energy cost savings within 15 years, including principal and interest.

Only project-related costs, with invoices dated after loans are officially awarded by the Energy Commission, are eligible to be reimbursed from loan funds. The final 10% of the funds will be retained until the project is completed. Interest is charged on the unpaid principal computed from the date of each disbursement. The repayment schedule is up to 15 years and will be based on the annual projected energy cost savings from the aggregated projects.

Infrastructure State Revolving Fund Program

www.ibank.ca.gov/infrastructure_loans.htm

The Infrastructure State Revolving Fund Program provides direct low-cost loans for local governmental public infrastructure projects, including:

- County streets
- County highways
- Environmental mitigation measures
- Parks and recreational facilities
- Public transit
- Solid waste collection and disposal

Yolo County can consider applying for these low-interest loans to implement a wide range of CAP measures. Though some eligible projects would be considered public projects, other eligible projects are pertinent to specific measures in this CAP. In particular, the transportation- and waste-related measures could seek financing through this program. Loans are available in amounts ranging

from $250,000 to $10 million per applicant for Tier 1 loans, and $250,000 to $2.5 million per applicant for Tier 2 loans (the tier system is based on evaluation of project impact; the greater the project impact, the higher the cap on available funds).

Self Generation Incentive Program

www.cpuc.ca.gov/PUC/energy/DistGen/sgip/

The CPUC's Self-Generation Incentive Program (SGIP) provides incentives to support existing, new, and emerging distributed energy resources. The SGIP provides rebates for qualifying distributed energy systems installed on the customer's side of the utility meter. Qualifying technologies include wind turbines, fuel cells, and corresponding energy storage systems.

ENERGY BOND FINANCING

Qualified Energy Conservation Bonds

A Qualified Energy Conservation Bond (QECB) is a tax credit bond; issuers repay principal on a regular schedule, but generally do not pay interest. Instead, the holder of a QECB receives a federal tax credit in lieu of interest, which may be applied against the bond holder's regular and alternative minimum tax liability. The tax credit amount is treated as taxable interest income to the holder of the bonds.

The proceeds of QECBs can be used for one or more qualified conservation purposes: Though some eligible projects would be considered public projects, other eligible projects are pertinent to specific measures in this CAP. In particular, the following eligible project types could have broad applicability in funding the measures in this CAP: Type II-(ii) green community programs, Type III mass commuting facilities, and Type V public education campaigns.

TRANSPORTATION INCENTIVES AND PROGRAMS

Many State and regional grant programs are available to fund transportation and infrastructure improvements. The programs listed below represent the current status of the most relevant of these programs. It is, however, important to evaluate the status of a given program before seeking funding, as availability and application processes are updated periodically.

Safe Routes to Schools

Safe Routes to Schools is an international movement focused on increasing the number of children who walk or bicycle to school by funding projects that remove barriers to doing so. These barriers include a lack of infrastructure, safety, and limited programs that promote walking and bicycling. In California, two separate Safe Routes to School programs are available: the State program referred to as SR2S, and the federal program referred to as SRTS. Both programs fund qualifying infrastructure projects.

AGRICULTURE PROGRAMS

California Department of Food and Agriculture

www.cdfa.ca.gov/

The California Department of Food and Agriculture (CDFA) provides financial resources to support GHG mitigation strategies.

The success of the CAP depends in part on collaboration between businesses, the public, and the County.

US Department of Agriculture Food, Conservation, and Energy Act

The Food, Conservation, and Energy Act, also known as the Farm Bill, is the primary agricultural and food policy tool of the federal government. The comprehensive bill is passed about every five years (most recently in 2008) by the United States Congress to address agriculture and other affairs under the purview of the USDA. The USDA and its research branch, the Economic Research Service, provide information on programs available to farmers.

OTHER CLIMATE PROGRAMS

CAL FIRE Climate Change Program

Under the authority of the Urban Forestry Act, the CAL FIRE Urban Forestry Program offers grants of over $1 million dollars per year to plant trees, and over $2.5 million for related forestry projects in urban communities throughout California.

CAL FIRE has identified five forestry strategies to reduce or mitigate GHG emissions:

- Reforestation to promote carbon sequestration
- Forestland conservation to avoid forest loss to development
- Fuel reduction to reduce wildfire emissions and utilization of those materials for renewable energy
- Urban forestry to reduce energy demand through shading, increase sequestration, and contribute biomass for energy generation
- Improved management to increase carbon sequestration benefits and protect forest health

These strategies were recognized by the Governor's Climate Action Team reports in 2006 and 2007, and by ARB in the Climate Change Scoping Plan.

PARTNERSHIPS WITH PRIVATE COMPANIES AND OTHER ORGANIZATIONS

The greater Sacramento area is home to numerous private companies who provide renewable energy or green infrastructure. The success of the CAP depends in part on collaboration between these businesses and the County and public. For example, numerous companies are involved in developing electric plug-in auto charging station infrastructure throughout the greater Sacramento area. PG&E administers energy efficiency programs that the County can leverage and promote to residents. Solar companies will also be an important asset to the CAP, as the advent of the Power Purchase Agreement (PPA) enables businesses, residents, and the County to install solar panels and access solar power at no cost. Partnering with new and existing businesses will enable the County to save money and provide the community with up-to-date green infrastructure.

Power Purchase Agreements

Renewable energy has become increasingly more accessible and cost-effective due to Power Purchase Agreements (PPAs). In a PPA, a private company or third party installs a renewable energy technology, often solar panels, at no cost to the consumer and maintains ownership of the installed panels, selling customers the power produced on a per kilowatt-hour basis at a contractually-established rate. The rate is lower than what customers pay their utility today, and increases at a fixed percentage (usually 2.5% to 4.0%) annually, which is typically lower than utility rate escalation. In addition to installing the panels, the third party monitors and maintains the systems to ensure functionality. The contract period for a PPA is typically 15 years, at which point the third party will either uninstall the panels or sign a new agreement with the building owner. These agreements are ideal for demonstration projects implemented by the County and residents or businesses with interests in reducing carbon emissions associated with energy consumption in their homes and businesses. This form of financing is becoming increasing popular in Yolo County, with a number of companies specializing in this form of financial transaction locating in the greater Sacramento area.

Energy Savings Performance Contracting

The basic concept of an Energy Savings Performance Contract (ESPC) is that an Energy Services Company (ESCO) guarantees the amount of energy saved, and further guarantees that the value of that energy would be sufficient to make the debt service payments as long as the price of energy does not fall below a stipulated floor price. The key benefits of the guaranteed savings include:

- The amount of energy saved is guaranteed
- The value of energy saved is guaranteed to meet debt service obligations down to a stipulated floor price
- The County carries the credit risk
- Tax-exempt institutions can use their legal status for much lower interest rates
- ESCO carries only the performance risk

Typically, an ESPC project would have a simple payback of 10 years or less to allow for the cost of money and other fees to be included in the overall project payback.

Energy efficiency mortgages can provide homeowners additional financing for energy efficiency improvements at discounted interest rates.

Lending institutions look for payment terms of less than 15 years for all costs including fees.

Typical projects include:

- Energy management systems
- Interior and exterior lighting
- Boiler replacement/repair of steam systems
- High-efficiency HVAC systems
- LED traffic systems
- Wastewater treatment plant pumps and motors

There are numerous ESCOs with track records in the greater Sacramento area.

Energy Efficiency Mortgages

www.hud.gov/offices/hsg/sfh/eem/energy-r.cfm

Energy Efficiency Mortgages can provide owners additional financing (whether at time-of-sale or upon refinancing) for energy efficiency improvements at discounted interest rates. Energy efficiency upgrades could be chosen that would allow owners to realize a net monthly savings. The Federal Housing Administration (FHA) offers an Energy Efficient Mortgage Loan program. This program helps current or potential homeowners significantly lower their monthly utility bills by enabling them to incorporate the cost of adding energy-efficient improvements into their new home or existing housing. This FHA program eliminates the need for homeowners who are interested in making their home more energy efficient to take out an additional mortgage to cover the cost of the improvements. Improvements can be included in a borrower's mortgage only if the total cost is less than the total dollar value of the energy that will be saved during its useful life. The program is available as part of a FHA-insured home purchase or by refinancing a current mortgage loan.

Energy Star™, a program under the DOE, offers another energy efficient mortgage option, though it is in a pilot phase and not currently available in California. This program is designed to encourage comprehensive energy efficiency improvements to new and existing homes by increasing the affordability and availability of energy efficiency mortgages for homeowners and homebuyers. These mortgages include the cost of energy efficiency investments in the loans, so that borrowers can pay for the improvements over the life of their loans, as well as deduct the interest from their federal and State income taxes. One of the key benefits of an Energy Star™ mortgage is that a borrower can finance energy-saving improvements to their home without paying more than he/she would for a typical mortgage. Following completion of the pilot phase, this program will be extended to California.

PARTNERSHIPS WITH OTHER JURISDICTIONS AND ORGANIZATIONS

Partnering with neighboring jurisdictions is a key implementation strategy supporting the CAP. Various jurisdictions within Yolo County could serve as potential partners in implementing the CAP strategies. The County should seek to partner with appropriate local governments, as identified within CAP measures. Other potential partners include:

General Plan Action IN-11 directs the County to pursue legislation seeking authority at the local level to charge fees for the implementation of climate change programs.

- Sacramento Area Council of Governments (SACOG)
- Pacific Gas & Electric (PG&E)
- Water Districts: Dunnigan Water District, Colusa Drain Mutual Water Company, Yolo County Flood Control & Water Conservation District, Yolo-Zamora Water District, Colusa County Water District, North Delta Water Agency, and Reclamation Districts
- Water Resources Association of Yolo County (WRA)
- Yolo-Solano Air Quality Management District (Yolo-Solano AQMD)
- Yolo County Resource Conservation District
- Natural Resources Conservation Service
- United States Green Building Council (USGBC) – Northern California Chapter

Yolo County Funds

Special Revenue Funds are restricted to expenditures for specific purposes. Many of these purposes are consistent with the Climate Action Plan, such as recycling awareness programs and the construction and maintenance of transit services. Sources of these funds include Federal and State grants and voter-approved taxes, fees and bonds.

County Facility Service Authorization (FSA) fees are collected to provide adequate capital facility improvements needed to serve new development within the county. These fees are allocated to specific activities as described in the County Code. They may be used to retrofit existing County buildings to improve energy efficiency and to construct new buildings consistent with LEED standards.
As proposed in some measures, mitigation fees may be used by developers to fund activities to offset the GHG emissions generated by specific projects. Such activities could include riparian forest restoration, hedgerow planting, and/or energy retrofits to existing residences.

The General Fund is the primary operating fund of the County. It is used to account for those resources traditionally associated with governments which are not required by law or administrative action to be accounted for in another fund. The General Fund is used to account for the cost of the County's current governmental operations. However, in the current economic downturn, General Fund resources are severely overstrained and cannot be relied upon to provide the sole funding for implementation of the CAP.

Self-Financing Strategies

CAP measures include a range of incentives and regulations. It is important that any fees established to implement the CAP be self-financing. Money raised through the fees would then be used to carry out those CAP measures determined to provide the best mitigation results. Yolo County will actively explore opportunities to establish self-financing strategies. In particular, Action IN-11 in the 2030 General Plan directs staff to pursue legislation seeking authority at the local level to charge fees for the implementation of climate change programs.

RELATIONSHIP TO THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

Effective March 18, 2010, the State adopted numerous amendments to the California Environmental Quality Act (CEQA) Guidelines to address the potential for environmental impacts associated with GHG emissions. The County's General Plan and certified General Plan EIR anticipated those changes and the CAP is fully consistent with the applicable guidelines provisions, as described further below.

The discussion below addresses the following topics: 1) CEQA compliance for adoption of the CAP; 2) reliance on the CAP for analysis and mitigation of cumulative GHG emissions from future projects; 3) adoption of new long-term CEQA thresholds of significance for future projects; and 4) procedures for demonstrating project-level CEQA compliance.

CEQA Compliance for Adoption of the CAP

CEQA requires the County to identify the significant environmental impacts of its discretionary actions and to avoid or mitigate those impacts, where feasible. GHG emissions are a complex, global, cumulative environmental issue that requires analysis under CEQA (CEQA Guidelines Section 15064.4 and Appendix G Checklist, part VII).

Adoption of the CAP is a discretionary action subject to CEQA review. Adoption of the CAP implements Action CO-A117 of the Yolo County 2030 General Plan[2], which was analyzed in the certified General Plan EIR. Pursuant to Section 15162 of the CEQA Guidelines, when an EIR has been certified for a project, no subsequent EIR is required unless: 1) revisions to the EIR are necessary to address new or substantially more severe significant impacts that result from changes in the project or changes in the circumstances under which the project is undertaken; or 2) new information of substantial importance identifies new or substantially more severe significant effects, or identifies new or better mitigation measures or project alternatives that the County would otherwise decline to adopt. In this case, adoption of the CAP was contemplated in the General Plan and, therefore, included in the project description of the General Plan EIR. The analysis of the impacts from GHG emissions remains sound and applicable to the adoption of the CAP (see additional discussion below). Adoption of the CAP does not result in any new or substantially more severe significant impacts. Further, the CAP reflects industry best practices for mitigation strategies and calculations of reductions and the County is adopting the strategies as part of the CAP approval. Therefore, none of the situations requiring a subsequent EIR are triggered.

The General Plan EIR identified increases in GHG emissions and impacts from global climate change as significant and

[2] Referred to as Action CO-A115 in the General Plan EIR. This numbering was subsequently modified in the final General Plan.

The CAP has been developed, among other reasons, specifically to satisfy the requirements of Section 15183.5(b) of the CEQA Guidelines.

unavoidable impacts that would result from implementation of the General Plan due to associated increases in GHG emissions[3]. The General Plan EIR estimated 2008 ("existing") GHG emissions for the unincorporated County at 1,882,964 MT CO_2e/yr and projected 2030 (General Plan build-out) emissions at 2,188,332 MT CO_2e/yr[4]. This reflects an increase of approximately 305,370 MT CO_2e/yr, or 16% over existing conditions.

The detailed inventories prepared for the CAP have resulted in a much more precise estimate of actual 2008 emissions for the County of 648,252 MT CO_2e/yr. Similarly, 2030 emissions were projected at 1,385,590 MT CO_2e/yr, which reflects an increase of 737,338 MT CO_2e/yr, or 114% over existing conditions.

The difference between the General Plan emissions numbers and the CAP emissions numbers is in part a reflection of the state of the field at that time and in part a reflection of the more generalized "top down" method used to compile the General Plan estimate. For example, the General Plan work relied on standardized generic formulae that are not necessarily applicable in a rural county like Yolo, with limited development in small towns. In contrast, development of the CAP involved an extensive work effort to develop accurate inventories based on activity data and locally-specific rates of participation and/or consumption. Furthermore, the 2030 projection developed as a part of the General Plan EIR analysis assumed full build-out of the General Plan by 2030. The CAP projections are based on assumptions about the rate at which planned land uses (per the County General Plan) are likely to build-out over time, using up-to-date market and economic information generated by experts for consideration by the Board of Supervisors at the time the General Plan was adopted.

While the magnitude of the projected increase in GHG emissions is notably higher under the CAP than assumed in the General Plan EIR, the CAP 2030 projection in absolute terms is 802,742 MT CO_2e/yr (or 37%) below what was projected and analyzed in the General Plan EIR. In fact, the 2030 projection is 497,379 MT CO_2e/yr (or 26%) below the 2008 estimate analyzed in the General Plan EIR. Because the General Plan EIR's future 2030 gross emission estimate is greater than the CAP's 2030 projection, the environmental impacts of the County's GHG emissions, as reflected by the more detailed CAP methods would be less severe than the General Plan EIR estimates.

The General Plan EIR also addressed "conflict with plans and polices of other agencies" (such as the ARB Scoping Plan and AB 32) as an area of potential impact. Based on the policies and actions of the General Plan, including the requirement for the CAP, this was identified as less than significant. Through the research and analysis conducted for the CAP, the County estimates that 1990 emissions for

[3] Pages 353 through 368 of the Draft EIR Volume of the General Plan EIR.
[4] Pages 425 and 426 of the Response to Comments Volume of the General Plan EIR.

the unincorporated area were 613,651 MT CO_2e/yr. To demonstrate compliance with AB 32, the County has adopted this 1990 level of emissions as the mandatory target for 2020. Furthermore, in order to make progress towards a desired goal of 80% below 1990 levels in 2050, the County seeks to further reduce GHG emissions from the unincorporated area to 447,965 MT CO_2e/yr by the General Plan horizon year of 2030.

Implementation of the policies in the new General Plan, as compared to the 1983 General Plan, were identified in the General Plan EIR as beneficial related to global climate change effects, because they would result in more stringent environmental protection and greater accountability in the regulation of activities that cause GHG emissions. As demonstrated throughout the CAP, successful implementation will actually achieve emissions levels well below existing levels, thus exceeding the County's interim CEQA significance threshold of "no net increase", pursuant to Action CO-A118.

In short, the potential for net increases in GHG emissions associated with build-out under the General Plan were identified as significant and unavoidable in the General Plan EIR; however, successful implementation of the CAP will result in lower emissions in 2020 and 2030 than current levels. The potential for significant impact under CEQA is measured against existing conditions (CEQA Guidelines Sections 15126.2(a) and 15382). Therefore, adoption of the CAP (including the GHG reduction measures included within the plan) does not trigger any of the requirements of CEQA Section 15162 to prepare additional environmental analysis beyond the certified General Plan EIR. The certified General Plan EIR provides CEQA compliance for adoption and implementation of the CAP.

As anticipated and disclosed on page 2 of the Draft volume of the General Plan EIR, pursuant to Section 21083.3 of the Public Resources Code and Section 15183 of the CEQA Guidelines, the County will rely upon the certified General Plan EIR for the purposes of adoption of the CAP.

Reliance on the CAP for Analysis and Mitigation of Cumulative GHG Emissions
The CAP has been developed, among other reasons, specifically to satisfy the requirements of Section 15183.5(b) of the CEQA Guidelines. The CAP includes all of the recommended plan elements identified in this section including:

- Quantification of existing and projected GHG emissions for the entire unincorporated County area through 2050;

- Identification of a 2020 mandatory target for GHG emissions that is consistent with AB 32 and will achieve emissions levels below existing conditions, as well as goals for emissions levels in future years (2030, 2040, and 2050).

- Identification and analysis of GHG emissions associated with implementation of the General Plan based on calculation of the emissions resulting from types of projects that could develop within

each land use designation, as assigned geographically, based on the County's adopted Land Use diagram.

- Provision of substantial evidence in the form of substantiated analysis using best practices that demonstrates that implementation of specific measures (including performance standards) on a project by project basis will collectively achieve the adopted emission target.

- Inclusion of a monitoring program to track progress towards achieving the GHG emission target. Amendment of the plan is required if the GHG emissions target is not achieved.

A cumulative impact of concern under CEQA occurs when the net result of combined individual impacts compounds or increases other overall environmental impacts (CEQA Guidelines Section 15355). Because the target future year emissions levels adopted by the County are below existing emissions levels, by definition the adoption of the CAP would not contribute to or result in an adverse change in the environment; therefore, achievement of the County's reduced levels of emissions would not be cumulatively considerable.

As described for determining significance under Section 15064.4 and allowed for cumulative impact analysis under Section 15130 of the CEQA Guidelines, project-level contributions to cumulative effects will be considered less than cumulatively considerable if the project is consistent with the General Plan and CAP, because these plans will reduce GHG emissions overall. Therefore, consistency with the General Plan and CAP, including compliance with the applicable reduction measures, indicates that a later project is implementing its fair share of measures required to achieve the GHG target and thus fully mitigates GHG emissions impacts.

Adoption of CEQA Thresholds of Significance

As adopted on November 10, 2009, the General Plan contained interim significance thresholds for GHG emissions as follows:

Action CO-A118 – In the interim until the GHG Emissions Reduction Plan/Climate Action Plan is in effect, the following significance thresholds shall be used for project analysis:

- *Projects consistent with the General Plan and otherwise exempt under CEQA – Assumed to be de minimus.*

- *Projects consistent with the General Plan and subject to CEQA – Net zero threshold to be achieved by the applicant as follows:*

    - *Apply practical and reasonable design components and operational protocols to reduce project GHGs emissions to the lowest feasible levels;*

- *Use verifiable offsets to achieve remaining GHG reductions. To the greatest feasible extent, offsets shall be: locally based, project relevant, and consistent with other long term goals of the County;*

Adoption of this CAP includes amendment of the General Plan to incorporate a mandatory GHG emissions reduction target for 2020 and a reduction goal for 2030. Both are lower than existing conditions, thus ensuring no net increase in emissions over time.

As a part of the General Plan amendment, the interim significance thresholds are being amended to be consistent with the CAP. Consistent with Sections 15064.4 and 15064.7 of the CEQA Guidelines, new CEQA thresholds have been identified in the Yolo County General Plan as follows:

Action CO-A118 – Pursuant to and based on the CAP, the following thresholds shall be used for determining the significance of GHG emissions and climate change impacts associated with future projects:

1) *Impacts associated with GHG emissions from projects that are consistent with the General Plan and otherwise exempt from CEQA are determined to be* ***less than significant*** *and further CEQA analysis for this area of impact is not required.*

2) *Impacts associated with GHG emissions from projects that are consistent with the General Plan, fall within the assumptions of the General Plan EIR, consistent with the CAP, and not exempt from CEQA are determined to be* ***less than significant*** *or* ***mitigated to a less-than-significant level****, and further CEQA analysis for this area of impact is generally not required.*

   To be determined consistent with the CAP, a project must demonstrate that it is included in the growth projections upon which the CAP modeling is based, and that it incorporates applicable strategies and measures from the CAP as binding and enforceable components of the project.

3) *Impacts associated with GHG emissions from projects that are not consistent with the General Plan, do not fall within the assumptions of the General Plan EIR, and/or are not consistent with the CAP, and are subject to CEQA review are rebuttably presumed to be* ***significant*** *and further CEQA analysis is required. The applicant must demonstrate to the County's satisfaction how the project will achieve its fair share of the established targets including:*

- *Use of alternative design components and/or operational protocols to achieve the required GHG reductions;*

- *Use of real, additional, permanent, verifiable and enforceable offsets to achieve required GHG reductions. To the greatest feasible extent, offsets shall be locally based,*

project relevant, and consistent with other long term goals of the County;

The project must also be able to demonstrate that it would not substantially interfere with implementation of CAP strategies, measures, or actions.

Procedures for Demonstrating Project-Level CEQA Compliance

In order to demonstrate project-level compliance with CEQA relevant to GHG emissions and climate change impacts, applications for discretionary projects must include information that addresses the following:

1) Demonstrate consistency with the General Plan land use designation and applicable policies. This may be done in the form of a checklist developed by or acceptable to the County Planning Division.

2) Demonstrate consistency with the CAP, including consistency with the growth projections upon which the CAP modeling is based, and incorporation of applicable strategies and measures from the CAP as binding and enforceable components of the project.

3) Pursuant to Section 15064.4(a)(1) of the CEQA Guidelines, estimate the level of GHG emissions that would result from implementation of the project. This may be done using the County's on-line calculator or other model or methodology acceptable to the County. The calculator contains the best available information for this purpose and was specifically developed to assist in implementation of the CAP.

Upon receipt of this information, the County will verify that it is complete and acceptable, and enter the project emissions totals into a countywide database for purposes of CAP monitoring and reporting.

In conjunction with the requirements of General Plan Policy CC-4.11 for determining overall General Plan consistency and CEQA compliance, the County will determine whether or not the project requires additional analysis or environmental review. Assuming that the information provided substantiates the conclusion, a CEQA Guidelines Section 15183 Statutory Exemption or other appropriate determination will be filed and the project can be approved.

Appendices

CONTENTS

Appendix A

Emissions Inventory and Projections Methodology

2008-2050 EMISSIONS

Ascent Environmental, Inc. (Ascent) developed a base-year (2008) greenhouse gas (GHG) emissions inventory for sources in unincorporated Yolo County (County) and future-year (i.e., 2020, 2030, 2040, and 2050) GHG emission projections. Options for the County's GHG emission reduction targets were also calculated and evaluated for consideration. This appendix presents the results of each of these tasks. For details on the historic (1990) GHG emissions inventory, please refer to the section of this appendix titled *1990 Emissions*. Also, please note that the 1990 emissions inventory contains emissions information for the University of California, Davis (UCD), tribal activities, and the incorporated cities of Davis, West Sacramento, Winters, and Woodland.

The field of emissions inventory development and available tools and methods continue to evolve in the absence of standardized guidance. State-of-the-practice methods underlain by factual historical data were used to develop the inventory, as discussed below. The 2008 base-year inventory and projections were compiled for the following emission sectors: energy use (i.e., electricity, natural gas, propane, and water consumption); transportation; solid waste; stationary sources; construction and mining; agriculture; and wastewater treatment.

The 1990 historic and 2008 base-year inventories were developed using a consistent bottom-up approach to afford an "apples-to-apples" comparison. The 1990 historic inventory is occasionally discussed in the sections that follow; however, for details on preparation of the 1990 inventory, please see the section of this appendix titled *1990 Emissions*. Future year GHG emissions projections were developed under a scenario that does not account for emission reductions that would occur associated with CAP implementation, advances in technology, or emission reductions programs initiated by the State or federal government.

Key Assumptions

Emission Factors

An emission factor is a representative constant that relates the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant (EPA 2010); it is typically expressed as a rate of emissions per unit of the activity. Several reputable sources of information can be used to gather emissions information for use in inventory development.

Sources of GHG emission factors relied upon in preparation of the 2008 base-year inventory include the following:

- California Air Resources Board (ARB): On-Road Mobile-Source Emission Factor Model (EMFAC2007), Version 2.3., 2007.
- California Air Resources Board (ARB): Off-Road Mobile-Source Emission Factor Model (OFFROAD2007), Version 2.1., 2007.
- U.S. Environmental Protection Agency (EPA): AP-42 Compilation of Emission

Factors. Chapter 2.4 Solid Waste Disposal, 2008.

- The California Climate Action Registry (CCAR): General Reporting Protocol, Version 3.1., 2009.
- Intergovernmental Panel on Climate Change (IPCC): IPCC Guidelines for National Greenhouse Gas Inventories, 2006.

The above-mentioned emission factors represent GHG emissions from activities occurring in unincorporated Yolo County.

Consumption Data

The County's 2008 base-year inventory was prepared using consumption and generation data from the following reputable sources:

- Yolo County Central Landfill (YCCL) Joint Technical Document, 2007.
- Unincorporated Yolo County Waste Generation Study, 1991.
- Yolo-Solano Air Quality Management District (YSAQMD) Permitted Stationary Sources in Yolo County, 2008.
- Yolo County General Plan Background Report, 2005.
- Yolo County General Plan travel demand forecasting (TDF) model, Fehr & Peers, 2010.
- Community Service District Waste Discharge Requirements (Esparto, Knights Landing, Madison Waste Water Treatment Facilities data).
- California Energy Commission (CEC). Refining Estimates of Water-Related Energy Use in California. CEC-500-2006-118, 2006 (December).
- UCD. Agricultural and Resource Economics: Current Cost and Return Studies, 2010.
- Pacific Gas and Electric (PG&E). Aggregated Community-wide Natural Gas and Electricity Consumption data, 2008.
- Yolo County and Davis Public Works Department for water consumption data.
- Yolo County Agricultural Commissioner. 2008. Crop Reports.

Each of these sources includes data that are applicable to unincorporated Yolo County.

GHG emissions projections were modeled using County-specific activity data, where available, from the County's 2030 General Plan. Because full buildout of the general plan would overestimate likely growth in the unincorporated County by 2030, a more likely population of approximately 48,842 was assumed to estimate GHG emissions projections. Where County-specific activity data were not available (e.g., for years 2040 and 2050), GHG emissions projections were conducted assuming that the general plan would build out by approximately 2050.

Summary of Results

Countywide 2008 base-year emissions were calculated using a "bottom-up" approach, which involves multiplication of an emission factor for a given process by activity data describing that process. This approach ensures the highest level of control over the quality of the data used to generate the emissions inventory. Table A-1 summarizes the magnitude and relative contribution of estimated 2008 base-year emissions for each sector. Methods used to calculate each emission sector are described in the sections that follow. For detailed assumptions, please refer to the attached documentation. The results of the 1990 historic inventory are presented here for informational purposes. Please refer to the section of this appendix titled *1990 Emissions* for more detailed information.

Table A-2 summarizes the results of the 1990 historic, 2008 base-year inventory, and projections for 2020, 2030, 2040, and 2050.

Figure A-1 summarizes the relative contributions of each emissions sector to the total 1990 historic emissions in unincorporated Yolo County.

Figure A-2 summarizes the relative contributions of each emissions sector to the total 2008 base-year emissions in unincorporated Yolo County.

Figure A-3 describes the emissions growth trend in unincorporated Yolo County over the inventory and projection periods.

YOLO COUNTY GREENHOUSE GAS EMISSIONS INVENTORY METHODS

This section briefly summarizes the methods applied to each sector in the County's 2008 base-year inventory and the projections. Detailed assumptions and quantification inputs are available online and upon request from the Yolo County Planning and Public Works Department. Information on development of the 1990 inventory is provided below where pertinent to the discussion. For complete details on methods used to develop the 1990 inventory, please refer to the section of this appendix titled *1990 Emissions*.

Energy Consumption

Inventory Methods

For the 1990 historic inventory, electricity, natural gas, and propane consumption data for residential and non-residential land uses were based on data from the 1982 *Yolo County Energy Plan*. Consumption rates were extrapolated to 1990 using population growth estimates from the DOF (DOF 2010a). Consumption data for the 2008 base-year was obtained directly from PG&E for accounts located within the unincorporated County. Emission factors from the CCAR General Reporting Protocol were used to calculate carbon dioxide equivalent (CO_2e) emissions from these fuel types.

GHG emissions associated with water consumption (i.e., conveyance, treatment, and distribution) were estimated using water consumption data obtained from the County and the City of Davis (for Royal

Table A-1:
Unincorporated Yolo County Greenhouse Gas Emissions Inventory

Emissions Sector	1990 Historic Inventory		2008 Base-Year Inventory		
	MT CO_2e	%	MT CO_2e	%	% Change from 1990
Energy Consumption[1]	131,652	21.5%	181,447	27.8%	37.8%
Transportation	155,577	25.4%	105,253	16.1%	-32.3%
Solid Waste	1,654	0.3%	6,871	1.1%	315.5%
Agriculture	292,032	47.6%	297,341	45.6%	1.8%
Residue Burning	14,669	5.0%	13,917	4.7%	-5.1%
Livestock	30,000	10.3%	45,257	15.2%	50.9%
Rice Cultivation	28,389	9.7%	34,131	11.5%	20.2%
Farm Equipment	72,170	24.7%	71,667	24.1%	-0.7%
Agricultural Irrigation Pumps	39,231	13.4%	39,231	13.2%	0.0%
Pesticide Application	83	0.0%	35	0.0%	-58.4%
Fertilizer Application	98,982	33.9%	79,966	26.9%	-19.2%
Lime Application	4,344	1.5%	11,774	4.0%	171.0%
Urea Application	4,164	1.4%	1,362	0.5%	-67.3%
Wastewater Treatment	256	0.0%	974	0.1%	281.1%
Construction & Mining	14,954	2.4%	29,271	4.5%	95.7%
Stationary Sources	17,526	2.9%	30,583	4.7%	74.5%
Facilities	3,974	22.7%	8,220	26.9%	106.9%
Agricultural Processing	10,905	62.2%	16,483	53.9%	51.1%
Equipment	2,647	15.1%	5,880	19.2%	122.2%
Total[2]	**613,651**	**100%**	**651,740**	**100%**	**6.2%**

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons.
[1] The energy consumption sector includes emissions from electricity production, natural gas and propane combustion, and water consumption.
[2] Totals may not match exactly the sum of the numbers in the applicable column due to rounding.
Source: Data compiled by Ascent Environmental, Inc. and AECOM in 2010.

Table A-2: Unincorporated Yolo County 1990 Historic and 2008 Base-Year Greenhouse Gas Emissions Inventory and Future-Year Projections						
Emissions Sector	Unincorporated Yolo County (MT of CO_2e)					
	1990	2008	2020	2030	2040	2050
Energy Consumption[1]	131,652	181,447	404,929	628,444	689,093	748,757
Transportation	155,577	105,253	285,492	465,731	510,677	554,733
Solid Waste	1,654	6,871	12,660	18,449	20,230	21,975
Agriculture	292,032	297,341	289,482	281,624	281,624	281,624
Wastewater Treatment	256	974	974	709	709	709
Construction & Mining	14,954	29,271	34,414	39,558	39,558	39,558
Stationary Sources	17,526	30,583	37,068	43,588	43,588	43,588
Total [2]	**613,651**	**651,740**	**1,065,038**	**1,478,103**	**1,585,478**	**1,690,944**

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons.
[1] Energy consumption includes emissions from electricity production, from natural gas and propane combustion, and domestic water consumption.
[2] Totals may not match exactly the sum of the numbers in the applicable column due to rounding.
Source: Data compiled by Ascent Environmental, Inc. in 2010.

Figure A-1

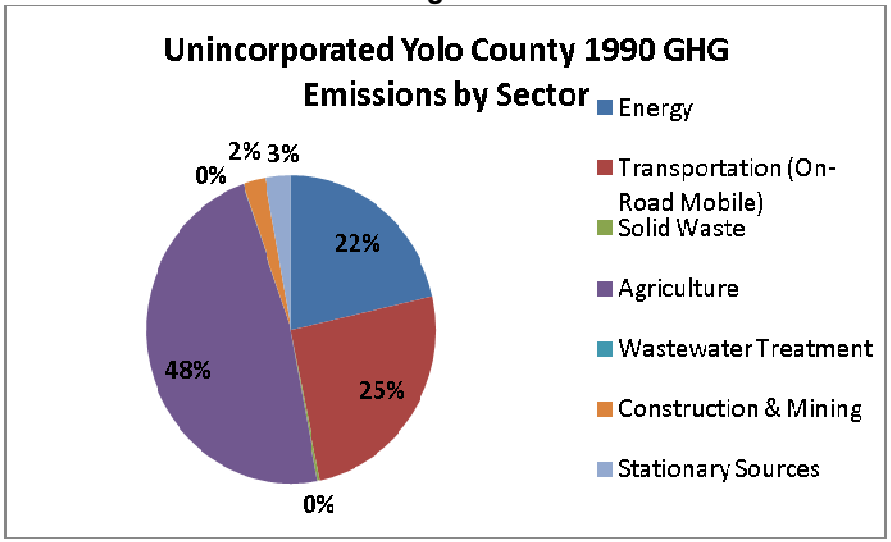
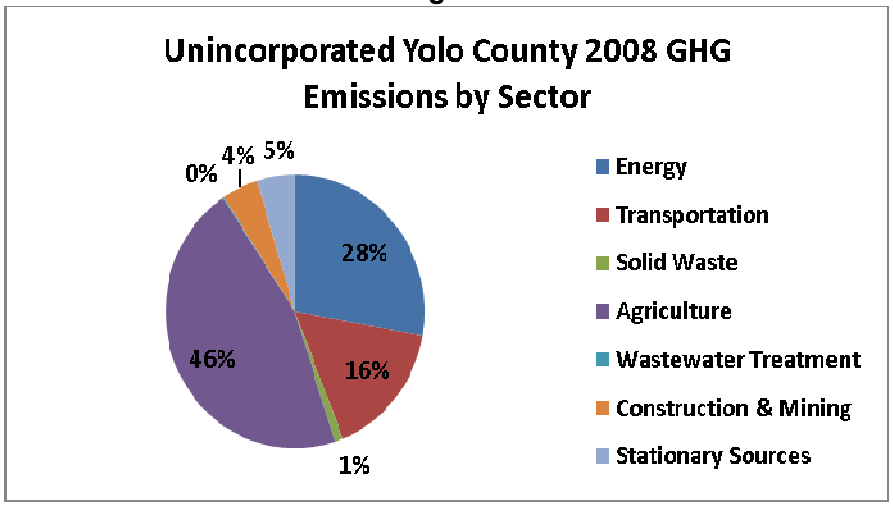


Figure A-2



Oaks and El Macero, which are located in the unincorporated County, but are provided water by the City of Davis). Emission factors from CCAR for electricity consumption were used to calculate CO_2e. Water consumption-related CO_2e emissions were included within the energy sector, because electricity is used to convey, treat, and pump water. Agriculture related water consumption is included as a sub-sector under agricultural emissions as agricultural irrigation pumps.

Projection Methods

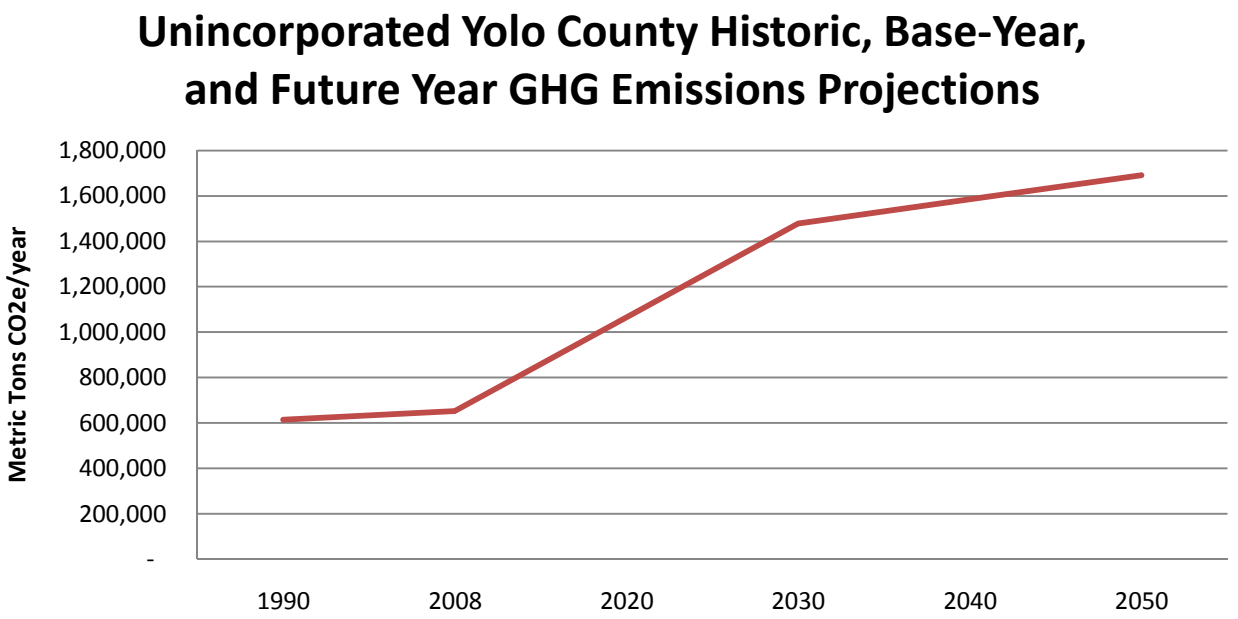
Energy-related GHG emissions for the 2030 projection were based on data from the Public Utilities section of the Yolo County General Plan EIR and fuel consumption growth rates from the U.S. Department of Energy, Energy Information Administration (2010) for the Pacific Region (which includes California). These projected 2030 energy consumption values were scaled down proportionally because it was assumed that only approximately 50% of the general plan would build out by 2030. Energy-related GHG emissions for the 2020 projection were interpolated between 2008 and 2030. Energy consumption growth rates were not available for the 2040 and 2050 projections; thus, population growth rates in Yolo County were used as an indicator of growth in energy consumption for those years assuming that the general plan would build out by approximately 2050. No emission reductions from statewide energy conservation programs or renewable energy requirements were accounted for in GHG emissions projections in Table A-2. See Table A-8 for estimates of reductions that may occur associated with State and federal GHG reduction programs and legislation.

Transportation

Inventory Methods

On-road mobile-source emissions for the 1990 historic inventory were calculated using Caltrans Highway Performance Monitoring System (HPMS) data for roadways in the unincorporated County, along with emission factors from EMFAC 2007 by speed bin (i.e., portion of vehicle miles traveled [VMT] that would occur within a range of 5-mile-per-hour increments). HPMS data for 1990 was used in combination with data prepared by Fehr & Peers (2010) from the Yolo County General Plan Traffic Demand Forecasting (TDF) model, which included 2005 VMT data by speed bin. The dataset obtained from Fehr & Peers accounted for trips that did not originate or terminate in the County by apportioning 50% of VMT and

Figure A-3



associated GHG emissions to Yolo County for internal-to-external trips, and external-to-internal trips. VMT and associated GHG emissions resulting from internal-to-internal trips were allocated 100% to Yolo County. This methodology is consistent with the Regional Target Advisory Committee (RTAC) recommendations in response to Senate Bill (SB) 375.

These data were used to derive a correction factor to apply to the 1990 Caltrans dataset to achieve a more accurate 1990 VMT number. Another correction was applied to the Caltrans dataset in order to allocate a percentage of the VMT that occurs on state highways to origins and/or destinations within the unincorporated County, based on 1990 population.

Transportation-related GHG emissions for the 2008 base-year inventory were calculated using emission factors from EMFAC 2007 by speed bin, and 2005 VMT data from the Yolo County General Plan TDF model. According to Caltrans HPMS traffic counts, VMT did not change significantly between 2005 and 2008, so 2005 VMT is treated as representative of 2008 conditions.

Projection Methods

Mobile-source-related GHG emissions were modeled for 2030 with the same method used to calculate 2008 mobile-source emissions. 2030 VMT data was obtained from Fehr & Peers by speed bin for the full general plan build-out. This value was scaled down proportionally because it was assumed that approximately 50% of the general plan would build out by 2030. 2020 mobile-source GHG emissions were interpolated between 2008 and 2030 emissions, and 2040 and 2050 emissions were projected using population growth rates for Yolo County that assume full general plan buildout by approximately 2050. Table A-2 does not account for reductions in emissions from statewide programs related to mobile sources (e.g., Pavley emission standards, low carbon fuel standard, or SB 375). See Table A-8 for estimates of reductions that may occur associated with State and federal GHG reduction programs and legislation.

Solid Waste

Inventory Methods

GHG emissions related to solid waste disposal were calculated using methods from EPA for the Yolo County Central Landfill (YCCL), which describes exponential decay of solid waste proportionate to the quantity of waste in place. Waste generation data for the 2008 base-year inventory were obtained from YCCL's Joint Technical Document (2007), from the Yolo County General Plan EIR, and from Yolo County Department of Public Works staff.

Projection Methods

Solid waste-related GHG emissions were modeled for the 2030 projection using waste generation data provided in the Yolo County General Plan EIR, scaled down proportionally assuming that approximately 50% of the general plan would build out by 2030. The same emissions modeling techniques were used for the YCCL as described above. Solid waste-related GHG emissions for the 2020 projection were interpolated between 2008 and 2030, and emissions for the 2040 and 2050 projections were derived using population growth rates for Yolo County that assume full general plan buildout by approximately 2050. Projected solid waste disposal data accounts for the County's 75% waste diversion requirement.

Agriculture

Inventory Methods

Agricultural sources of GHG emissions include off-road farm equipment, irrigation pumps, residue burning, livestock, pesticide application, rice cultivation, lime and urea application, and fertilizer volatilization. The process data for Yolo County's agricultural sector were obtained from a variety of sources, as discussed in detail below. GHG emission factors associated with farming equipment were obtained from OFFROAD2007. The GHG emission factor for agricultural irrigation pumps and the number of pumps in the county were obtained from ARB's GHG emissions inventory (ARB 2006, ARB 2003). Fertilizer application data were obtained from UCD, Agriculture and Resource Economics Department *Current*

Cost and Return Studies (UCD 2010). Emission factors and methods to quantify GHG emissions associated with fertilizer application were obtained from ARB's GHG emissions inventory (ARB 2007). Calendar year 1990 and 2008 process data for acres of rice and other crops cultivated and livestock populations in Yolo County were obtained from Yolo County's 1990 and 2008 *Annual Crop Reports* (Yolo County 1990, 2008). Emission factors and quantification methods for enteric fermentation and manure management were obtained from the ARB's GHG emissions inventory (ARB 2007). GHG emissions associated with lime and urea application were obtained from UCD. Agricultural GHG emissions by source type are available online and by request from the Yolo County Planning and Public Works Department.

Projection Methods

Agricultural emissions were not anticipated to increase between the 2008 base-year and 2020 and beyond, because the total amount of agricultural land within Yolo County is not expected to increase above existing conditions. Planned growth in agricultural processing facilities is discussed further under Stationary Sources. Unlike other sectors, agriculture has a high potential for annual emissions variability, because the emission rates for crop types, fertilizer application requirements, and other practices can be considerably different. According to the Land Use and Housing section of the County's 2030 General Plan EIR, approximately 58,821 acres of land would be redesignated from agricultural purposes to other purposes under the 2030 General Plan, as compared with the County's 1983 General Plan (Yolo County 2009). However, it is important to note that much of the land that would be redesignated from agricultural purposes to other purposes was being operated as open space, forest, or public, and was not being actively farmed. Thus, the change in land use designation may not actually represent a change in active land use type for many parcels in Yolo County. Farmers and ranchers will likely change their crops, activities, and practices multiple times within the 60-year timeframe of these emissions estimates and projections in response to market demand, weather, water availability, and other unpredictable factors. These changes could either increase or decrease GHG emissions. Also, although the total amount of agricultural land is expected to decrease according to the General Plan, this does not necessarily translate to a decrease in GHG emissions, because the variability in GHG-emissions intensity of different crop types can be greater than the predicted acreage decrease. Other factors such as change in livestock populations (e.g., increase in dairy cattle population) change in fertilizer application practices, growth in organic crop production, and change in pesticide application practices in Yolo County between 1990 and 2008 have historically contributed to changes in overall agricultural-related GHG emissions, and would be expected to continue to do so in the future. For these reasons, it is difficult to project GHG emissions changes over time using agricultural activities. Therefore, reasonable assumptions were made by County staff based on current trends in Yolo County. In general, slight trends away from field crops (e.g., tomatoes, corn, and wheat) and toward perennial and orchard crops (e.g., wine grapes, almonds, and olives) were assumed to occur by 2030 based on input from the Agricultural Commissioner's office and from planning staff. In addition, specific anticipated agricultural acreage that would be taken out of production and converted to development was also removed from 2030 agricultural GHG emissions. Beyond 2030, the approach to project future agricultural emissions was to keep the 2030 estimates constant into the future. Refer to Table A-3 for the 1990 and 2008 GHG inventories and 2030 projections by sub-sector.

In addition, Ascent calculated GHG emissions by crop type per 100 acres in 2008. The estimates in Table A-4 include GHG emissions from fertilizer application, residue burning, and rice cultivation only. Please note that there are other types of emissions associated these crops and the data provided herein is for information purposes only.

Wastewater Treatment

Inventory Methods

Methane emissions from wastewater treatment facilities were calculated using process data (e.g., treatment capacity, biological oxygen demand) for the three wastewater treatment facilities that serve unincorporated Yolo County. Ascent obtained this information from Esparto, Knights Landing, and Madison Community Service District Waste Discharge Requirements facility permit records from the Central Valley Regional Water Quality Control Board. Base year influent data were obtained from the Public Utilities section of the Yolo County General Plan EIR.

Table A-3
Unincorporated Yolo County 1990 Historic and 2008 Base-Year Greenhouse Gas Emissions Inventory and Future-Year Projections for Agricultural Subsectors

Emissions Subsector	Unincorporated Yolo County (MT of CO_2e)		
	1990	2008	2030
Residue Burning	14,669	13,917	11,366
Livestock	30,000	45,257	38,877
Rice Cultivation	28,389	34,131	38,686
Farm Equipment	72,170	71,667	71,667
Agricultural Irrigation Pumps	39,231	39,231	39,231
Pesticide Application	83	35	35
Fertilizer Application	98,982	79,966	68,625
Lime Application	4,344	11,774	11,774
Urea Application	4,164	1,362	1,362
Total [1]	**292,032**	**297,341**	**281,624**

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons.
[1] Totals may not match exactly the sum of the numbers in the applicable column due to rounding.
Source: Data compiled by Ascent Environmental, Inc. in 2010.

The GHG emissions associated with secondary wastewater treatment processes were quantified using methods and emission factors from IPCC for centralized, aerobic wastewater treatment plants, which are representative of processes at these facilities (IPCC 2006b). GHG emissions from tertiary treatment plants are contained in the PG&E dataset and are included in the energy sector.

Projection Methods

It was assumed that wastewater treatment facilities within Yolo County would transition from secondary to tertiary treatment processes between 2008 and 2030, with the exception of Esparto's plant. The Esparto plant was assumed to operate at capacity in 2030, as described within the Public Utilities section of the Yolo County General Plan EIR. Additional capacity would likely be needed beyond 2030; however, any new facilities would be packaged tertiary treatment plants, which do not generate methane. Instead, GHG emissions from tertiary treatment facilities would be included in the energy sector.

Anticipated tertiary facilities would be associated with the Dunnigan Specific Plan and Elkhorn developments, and the Madison and Knights Landing districts. A tertiary wastewater treatment plant is already serving the Wild Wings development.

Other Sources

Construction & Mining

Ascent calculated 1990 historic and 2008 base-year GHG emissions from construction and mining activities within unincorporated Yolo County using emission factors and inventory data from the OFFROAD model. It was not possible to allocate emissions to the respective

activities because the OFFROAD model is equipment-based, rather than activity-based. Thus, it was not possible to determine which pieces of equipment in the OFFROAD model were used for construction and which were used for mining. Please note that this sector only includes emissions associated with the on-site use of heavy-duty equipment. Emissions associated with the land uses themselves (e.g., off-site transportation and energy use) are included in the other sectors as applicable. Also, for the sake of clarification, the issue of fugitive particulate matter dust emissions, which is typically associated with mining activities, is not addressed in this inventory as such are not classified as GHGs. It is unknown whether construction and mining-related GHG emissions would increase beyond 2030, and thus, were held constant after 2030.

Table A-4
Year 2008 Greenhouse Gas Emissions by Crop Type

Crop Type	MT CO_2e/100 acres/year	Crop Type	MT CO_2e/100 acres/year
Almonds	74	Pistachio Nuts	34
Wine Grapes/Kiwi	3	Plums	21
Walnuts	93	Tangerines	18
Prunes	25	Tomatoes	34
Pears, Bartlett	34	Asparagus	15
Pears, Others/Persimmons	34	Misc Vegetables	17
Apples	4	Misc Fruits	20
Apricots	21	Barley	14
Cherries	26	Beans	18
Figs	13	Corn (and Milo)	19
Kiwi	20	Hay - Alfalfa	1
Nectarines	25	Hay - Grain	7
Olives	15	Oat and Misc Field Crop	10
Peaches (Freestone)	25	Pasture	15
Pluots/Apricots	21	Propogative and Nursery	3
Rice	142	Wheat	39

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons.
Source: Data compiled by Ascent Environmental, Inc. in 2010.

Stationary Sources

GHG emissions from stationary sources within the County were calculated in the 1990 historic and 2008 base-year inventories using facility permit data obtained from YSAQMD. The permit data contained fuel consumption activity information from which GHG emissions were calculated using CCAR emission factors. In addition, the OFFROAD model was used to obtain heavy-duty equipment emissions associated with industrial land uses within the County in both years. In 2008, the pesticide sulfuryl fluoride, which has a high GWP, was applied to commodities during agricultural processing. This was not a common practice in 1990. GHG emissions associated with the application of sulfuryl fluoride during processing are reported in the stationary source sector, under agricultural processing. According to the County's General Plan, agricultural commercial and industrial processing facilities are anticipated to increase during build-out. It was assumed that approximately 264 acres of additional agricultural industrial or agricultural commercial land uses would be built out by 2030; about an 82% increase from 324 acres in 2008. Thus, stationary-source emissions within the County would increase through 2030. It was unknown whether stationary-source emissions within

the County would increase or decrease beyond 2030, and thus, these were held constant after 2030.

Wetlands

According to the Global Climate Change section of the Yolo County General Plan EIR, there are approximately 14,855 acres of wetlands currently in Yolo County. Significant areas of seasonal wetland and marsh communities are found in the Yolo Basin, including the Vic Fazio Yolo Bypass Wildlife (Yolo Bypass) Area, private lands in the southern panhandle, the Conaway Ranch north of Interstate 80, and the City of Davis. Additional wetlands are found at the recently restored Roosevelt Ranch Preserve east of Zamora and in several other locations throughout the central and eastern portions of the County.

It is important to note that nearly all of this wetland development has occurred over the past 20 years. In fact, in recent years the pace of wetland creation has occurred at a faster rate than has urbanization. Between 2000 and 2008, about 1,371 acres of farmland were lost to community development in the unincorporated area. During this same time, approximately 4,225 acres of farmland were converted to wetlands. Since 2008, several significant new projects have been approved, primarily adjoining the Sacramento River and in the lower Yolo Bypass. Consequently, wetlands are playing an increasing role related to GHG emissions and climate change.

The Yolo Bypass Area is a public and private restoration project managed by the California Department of Fish and Game in consultation with the Yolo Basin Foundation. Managed wetlands in the Yolo Bypass Area are currently enclosed by levees and berms, and flooded with water from irrigation systems. The Yolo Bypass provides flood conveyance for the high flows from several northern California waterways to the Sacramento-San Joaquin River Delta. Whereas natural wetland hydrology is very dynamic, flooding cycles for managed wetlands can be made predictable through strategic and innovative management. Permanent wetlands are flooded year round; seasonal wetlands are drained the first of April and flooded the first of September each year. The management of productive wetlands requires not only water management, but also periodic soil and vegetation disturbances. In addition to seasonal and permanent wetlands, the Yolo Bypass Area includes annual grasslands, riparian scrub and woodlands, vernal pools, and row crop/seasonal wetlands. The primary row crop is rice, but other crops, including grains, are also produced across the northern and central portions of the Yolo Bypass Wildlife Area. Please note that emissions associated with these row crops are accounted for in the agricultural sector.

Wetlands sequester carbon in vegetation and inundated soils through the process of CO_2 uptake from the atmosphere, photosynthesis, and decomposition. On the other hand, wetlands result in the generation of GHGs including methane (CH_4), which has global warming potential 21 times that of CO_2, from the anaerobic decomposition of biomass (e.g., bacteria); nitrous oxide (N_2O) from nitrification and denitrification processes; and CO_2, CH_4, and N_2O from peat soil subsidence and oxidation associated with draining activities.

Wetlands are dynamic ecosystems, constantly changing due to the physical, chemical, and biological processes associated with floods, drought, and fire. More specifically, carbon and nitrogen cycling along with decomposition vary considerable based on location and time of year. Thus, there is currently a substantial amount of uncertainty involved with quantifying GHG emissions from wetlands unless site-specific information is available, which is not the case for Yolo County. For these reasons coupled with the fact that ARB does not include such sources in the statewide GHG emissions inventory, wetlands were not included in base-year emissions inventory.

However, it is important to note that even though site-specific research for wetlands located in Yolo County is not available, wetland-related GHG sequestration and generation rates have been developed in research and literature. These are summarized below for informational purposes only (e.g., to assist with the

further understanding of policy change and/or mitigation strategy implications), but please note that given the uncertainty in the research and substantial variability in location conditions these should not be considered precise or it some cases even applicable to Yolo County.

Studies have shown that freshwater marshes, a type of wetland, can sequester up to 25 metric tons of carbon per acre per year; saline marches, another type of wetland, from approximately 0.8 to 5.7 metric tons of carbon per acre per year; and freshwater wetlands approximately 0.3 metric tons per acre per year. Please note that results within these studies varied greatly depending on numerous factors (e.g., temperature, inundation regime, and plant species).

With respect to the generation of CH_4 from decomposition, studies have shown saline marshes release less CH_4 than their fresh water counterparts, tidal brackish wetlands can release approximately 0.5 to 1.9 metric tons of CO_2e per acre per year, and freshwater wetlands can release 1.6 to 7.8 metric tons of CO_2e per acre per year. The results of these studies varied greatly depending on numerous factors (e.g., evapotranspiration). Research concerning the generation of N_2O from nitrification and denitrification processes is very limited and has an extremely high degree of uncertainty because of the compound's complex chemistry, unknown strength of nitrifying and denitrifying processes in certain environments, and variability depending on biogeochemical characteristics of a wetland (e.g. labile carbon availability, nitrate availability, and redox potential).

Lastly, CO_2, and to a lesser extent CH_4 and N_2O emissions, from peat soil subsidence and oxidation associated with draining activities can result in carbon losses from approximately 2.02 to 6.07 metric tons per acre per year. The results of these studies also varied greatly depending on soil organic content, carbon content, temperature, and other factors.

In general, the majority of wetlands created in Yolo County are freshwater wetlands, fed by irrigation return water, groundwater, and/or surface flows. Broadly speaking, using the variable ranges cited above, these freshwater wetlands may contribute net GHG emissions of between 1.3 and 7.5 metric tons per acre of CO_2e per year. Depending on how they are managed (e.g., annually draining), the net impact may be as much as 3.3 to 13.6 metric tons. This is comparable to the emission rates for field crops such as hay, oats, barley, asparagus, and pasture; or orchard crops such as apples, olives, and figs. Although wetlands are estimated to account for less than 1% of all GHG emissions nationwide, they are an expanding part of the landscape that deserves more detailed study and consideration in the future.

Discussion

GHG emissions from most sectors increased between 1990 and 2008, except for transportation-related emissions. The reduction in transportation emissions is attributable to reductions in VMT and a reduction in CO_2 emission factors associated with improved vehicle fuel economy and fleet turnover during this 18-year time frame. Another factor is the historically low rate of growth and development allowed in the unincorporated area allowed under the 1983 General Plan. The reduction in VMT is also likely attributable to the method by which trips and VMT are allocated to the unincorporated County and to cities. Trips that may have originated or terminated in the unincorporated County in 1990 may have been from land annexed into cities prior to 2008 (e.g., Gibson Ranch [480 acres to City of Woodland in 1992] and Wildhorse [419 acres to City of Davis in 1995]). Thus, associated VMT would be allocated to the respective city per the methodology employed by Fehr & Peers and recommended by the RTAC.

Energy-related GHG emissions were estimated to increase at a higher rate than estimated population growth, despite factors such as annexation of land from County to city jurisdictions; the reduction in GHG emission factors from increased renewable energy in the State's electricity portfolio; and the affect of California energy conservation standards (Title 24) on the

County's new building stock. The discrepancy can be explained by the difference in datasets used to derive 1990 and 2008 energy-related GHG emissions. 1990 data was extrapolated from Yolo County's 1982 Energy Plan, whereas 2008 data was obtained directly from PG&E accounts. Nonetheless, these two datasets are applicable to the County, yield reasonable results, and represent the best available data. In addition, the higher rate of energy use is also attributable to changing consumer patterns over the past 20 years. The number of home computers, kitchen appliances, chargers, televisions, and other electronics has grown significantly between 1990 and 2008.

GHG emissions associated with agricultural activity in the unincorporated County increased overall between 1990 and 2008, but decreased within the sub-sectors associated with agricultural equipment, residue burning, pesticide application, and fertilizer application. The heavy-duty agricultural equipment fleet has become more efficient and currently includes better emission controls than in 1990, which explains the decline in emissions from agricultural equipment. Emissions from residue burning decreased, despite an increase in the number of acres of rice harvested, which is explained by implementation of regulations that limit residue burning. Pesticide application to commodities by farmers decreased from 1990 to 2008 because application of GHG-emitting pesticides became more prevalent at the agricultural processing stage, compared to the rate of application directly to crops (the application of pesticides as a part of processing operations is reported under stationary sources). Fertilizer application decreased between 1990 and 2008, in part, due to increased use of drip irrigation systems, the growth in organic crop production, and use of cover crops. Because water used to irrigate crops contains nitrates, farmers began monitoring nitrate content and decreased direct fertilizer application accordingly (Young, pers. comm., 2010). Please note that even though Yolo County has one of the largest percentages of agricultural acres on which organic practices occur, the development of these emission inventories were not able to be performed at a resolution to derive organic- specific information.

Agricultural GHG emissions from, livestock, rice cultivation, urea and lime application all increased from 1990 to 2008. According to County staff, dairy cattle population increased dramatically from 1990 to 2008, approximately 50 head to 2,200 head, respectively. Dairy cattle generate greater GHG emissions per head than beef cattle.

Stationary-source GHG emissions also increased between 1990 and 2008. Notably, GHG emissions from pesticide application increased considerably from 1990 to 2008, due to increased application of the pesticide sulfuryl fluoride, a GHG with high GWP.

Projected GHG emissions in energy, transportation, solid waste, and wastewater treatment sectors are attributable to population growth, as described in the projection methodology discussion of each sector. It is worth noting that a sizable portion of the incremental increase in GHG emissions projections from 2008 and 2030 would be attributable to the Dunnigan Specific Plan development, as will a sizable portion of the County's GHG emission reduction potential.

JURISDICTIONAL CONTROL

Of the sectors studied in the emission inventories, the sectors (and portions thereof) over which the County has jurisdiction are somewhat limited. For example, the County retains discretionary authority over land use decisions in its jurisdiction, which are known to influence VMT, but has no jurisdiction over fuel economy standards, which are controlled by the federal government. Similarly, the County has the ability to implement energy efficiency standards for buildings constructed in the unincorporated County, but it does not control the composition of PG&E's energy portfolio, which is regulated at the State level. The degree to which State and federal regulations may influence GHG emissions within the County is discussed later in this report.

Sectors over which the County has no control include the construction and mining equipment fleet and stationary source process emissions (e.g., although authority over these is regulated through the permitting process, the County does not have jurisdiction over equipment emission rates from the tail pipe, and stationary sources are essentially being addressed through the State Cap-and-Trade regulation). For these reasons, these sectors were removed from the inventory for purposes of GHG emissions reduction target development. The GHG emissions over which the County has some jurisdiction are reported in Table A-5.

Table A-5
Unincorporated Yolo County Jurisdictional Greenhouse Gas Emissions Inventory and Future-Year Projections

Emissions Sector	Unincorporated Yolo County (MT of CO_2e)					
	1990	2008	2020	2030	2040	2050
Energy Consumption [1]	131,652	181,447	404,929	628,444	689,093	748,757
Transportation	155,577	105,253	285,492	465,731	510,677	554,733
Solid Waste	1,654	6,871	12,660	18,449	20,230	21,975
Agriculture	292,032	297,341	289,482	281,624	281,624	281,624
Wastewater Treatment	256	974	974	709	709	709
Total [2]	**581,171**	**591,886**	**993,537**	**1,394,957**	**1,502,332**	**1,607,798**

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons.
[1] Energy consumption includes emissions from electricity production, from natural gas and propane combustion, and water consumption.
[2] Totals may not match exactly the sum of the numbers in the applicable column due to rounding.
Source: Data compiled by Ascent Environmental, Inc. in 2010.

1990 EMISSIONS

Ascent developed a historic GHG emissions inventory for sources in Yolo County for the year 1990 (County 1990 inventory). The County's 1990 inventory was compiled for the following emission sectors: energy use (i.e., electricity, natural gas, propane, and water consumption); transportation; solid waste; stationary sources; construction and mining; agriculture; and waste water treatment. This memorandum presents the results of the County 1990 inventory.

There is currently no agency-adopted or recommended protocol for preparation of community-wide GHG emissions inventories. The field of practice and available tools and methods continue to evolve in absence of standardized guidance. State-of-the-practice methods applied to factual historical data were used to develop the inventory, as discussed below.

Key Assumptions

Emission Factors

An emission factor is a representative constant that relates the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant (EPA 2010); it is typically expressed as a rate of emissions per unit of the activity. For example, the number of tons of CO_2e generated by an automobile per mile traveled is an emission factor. Several reputable sources of information can be used to gather emissions information for use in inventory development.

Sources of GHG emission factors relied upon in preparation of the County's 1990 inventory include the following:

- California Air Resources Board (ARB): On-Road Mobile-Source Emission Factor Model (EMFAC2007), Version 2.3., 2007.
- California Air Resources Board (ARB): Off-Road Mobile-Source Emission Factor Model (OFFROAD2007), Version 2.1., 2007.
- U.S. Environmental Protection Agency (EPA): AP-42 Compilation of Emission Factors. Chapter 2.4 Solid Waste Disposal, 2008.

- The California Climate Action Registry (CCAR): General Reporting Protocol, Version 3.1., 2009.
- Intergovernmental Panel on Climate Change (IPCC): IPCC Guidelines for National Greenhouse Gas Inventories, 2006.

The above-mentioned emission factors represent GHG emissions from activities occurring in Yolo County.

Demographic Data

1990 GHG emissions inventory data for certain sectors were either back-calculated or forecasted from the closest available data point using population data from the California Department of Finance (DOF 2010).

Consumption Data

The inventory was prepared using consumption and generation data from the following reputable sources:

- Yolo County Energy Plan, 1982.
- Yolo County Central Landfill (YCCL) Joint Technical Document, 2007.
- Unincorporated Yolo County Waste Generation Study, 1991.
- Yolo-Solano Air Quality Management District (YSAQMD) Permitted Stationary Sources in Yolo County, 1990.
- California Department of Transportation (Caltrans) Highway Performance Monitoring System (HPMS) California Public Road Data, 1990.
- Community Service District Waste Discharge Requirements (Esparto, Knights Landing, Madison Waste Water Treatment Facilities data).
- California Energy Commission (CEC). Refining Estimates of Water-Related Energy Use in California. CEC-500-2006-118, 2006 (December).
- University of California, Davis (UCD). Agricultural and Resource Economics: Current Cost and Return Studies, 2010.

Each of these sources includes data that are applicable to Yolo County.

Summary of Results

Countywide 1990 emissions were calculated using a "bottom-up" approach, which involves multiplication of an emission factor for a given process by activity data describing that process. For example, the emission factor for household energy use would be multiplied by the number of households within a jurisdiction at a specific time. This approach ensures the highest level of control over the quality of the data used to generate the emissions inventory. Where data were available, 1990 GHG inventories were prepared for the incorporated cities of Davis, West Sacramento, Winters, and Woodland. Emissions were also shown for UCD and tribal lands. However, these were kept separate from the unincorporated community emissions as they are distinct in terms of area, location, and operations. These inventories were not prepared with the same level of precision as the unincorporated County inventory, but are useful for comparison purposes.

Table A-6 summarizes the scale and relative contribution of estimated 1990 GHG emissions for each sector. Methods used to calculate each emission sector are described in the sections that follow. Detailed assumptions are available online and by request from the Yolo County Planning and Public Works Department.

Figure A-5 summarizes the relative contributions of each GHG emissions sector to the total 1990 GHG emissions in unincorporated Yolo County.

Figure A-6 summarizes the relative contributors of each jurisdiction to the total 1990 GHG emissions in Yolo County (i.e., unincorporated plus incorporated).

YOLO COUNTY HISTORIC GREENHOUSE GAS EMISSIONS INVENTORY METHODS

This section briefly summarizes emissions inventory methods applied for each sector in the historic (1990) inventory. Detailed assumptions and quantification inputs, are available online and by request from the Yolo County Planning and Public Works Department.

Energy Consumption

Electricity, natural gas, and propane consumption data for residential and non-residential land uses were based on data

Table A-6
Yolo County Historic Greenhouse Gas Emissions Inventory (1990)

Emissions Sector	Unincorporated Yolo County		Davis		West Sacramento		Winters		Woodland		UCD	Tribal Activities	Total Yolo County	
	MT CO_2e	%	MT CO_2e	%	MT CO_2e	%	MT CO_2e	%	MT CO_2e	%	MT CO_2e	MT CO_2e	MT CO_2e	%
Energy Consumption[1]	131,652	21.5%	268,791	56.6%	162,132	54.9%	26,962	63.0%	236,082	41.4%			825,618	39.0%
Transportation	155,577	25.4%	187,629	39.5%	122,107	41.4%	14,005	32.7%	166,341	29.2%			645,659	30.5%
Solid Waste	1,654	0.3%	11,264	2.4%	6,794	2.3%	1,130	2.6%	9,893	1.7%			30,735	1.5%
Agriculture	292,032	47.6%	-	-	-	-	-	-	-	-			292,032	13.8%
Wastewater Treatment	256	0.0%	7,013	1.4%	4,230	1.4%	703	1.6%	6,159	1.1%	-	-	18,361	0.9%
Construction & Mining	14,954	2.4%	-	-	-	-	-	-	-	-			14,954	0.7%
Stationary Sources	17,526	2.9%	<0.1	-	<0.1	-	<0.1	-	151,211	26.5%[3]			168,737	8.0%
UCD											120,991		120,991	5.7%
Tribal Activities												439	439	0.0%
Total[2]	**613,651**		474,696		295,262		42,800		569,686		120,991	439	2,117,525	

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons; UCD = University of California, Davis.
[1] The energy consumption sector includes emissions from electricity production, natural gas and propane combustion, and water consumption.
[2] Totals may not match exactly the sum of the numbers in the applicable column due to rounding.
[3] The stationary source sector for the City of Woodland comprises a larger portion of the emission inventory in comparison to the other incorporated and other unincorporated areas due to the fact more industry is located there.
Source: Data compiled by Ascent and AECOM in 2010.

from the 1982 *Yolo County Energy Plan*. Consumption rates were extrapolated to 1990 using population growth estimates from the California Department of Finance (DOF 2010). Emission factors from the CCAR General Reporting Protocol were used to calculate carbon dioxide equivalent (CO_2e) emissions from these fuel types.

GHG emissions associated with water consumption (i.e., conveyance, treatment, and distribution) were estimated using water demand rates from CEC for domestic uses and emission factors from CCAR for electricity consumption. Water consumption-related CO_2e emissions were included within the energy sector because electricity is used to convey, treat, and pump water.

Transportation

On-road mobile-source emissions for 1990 were calculated using Caltrans HPMS data

Figure A-5

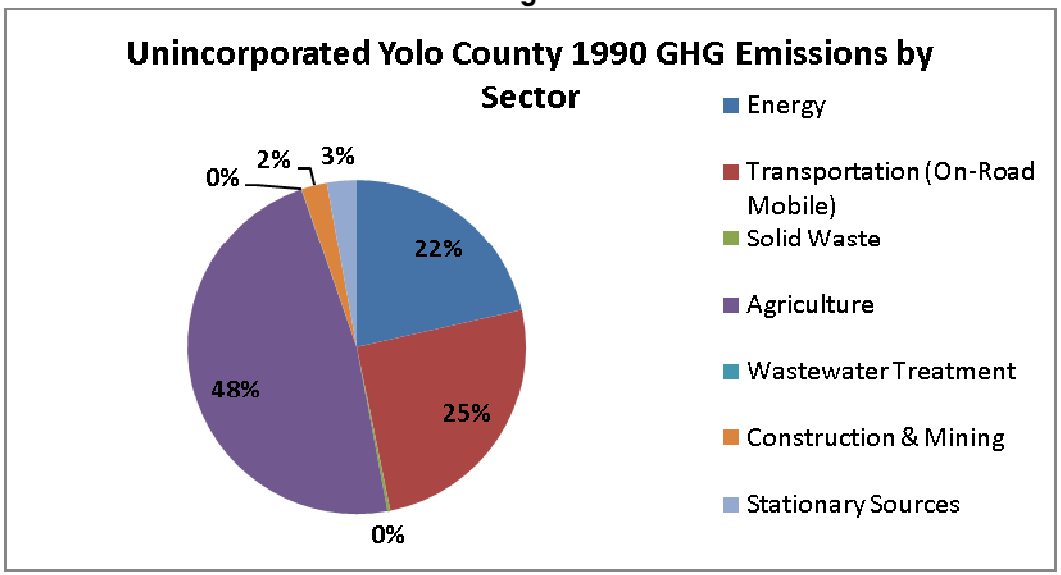
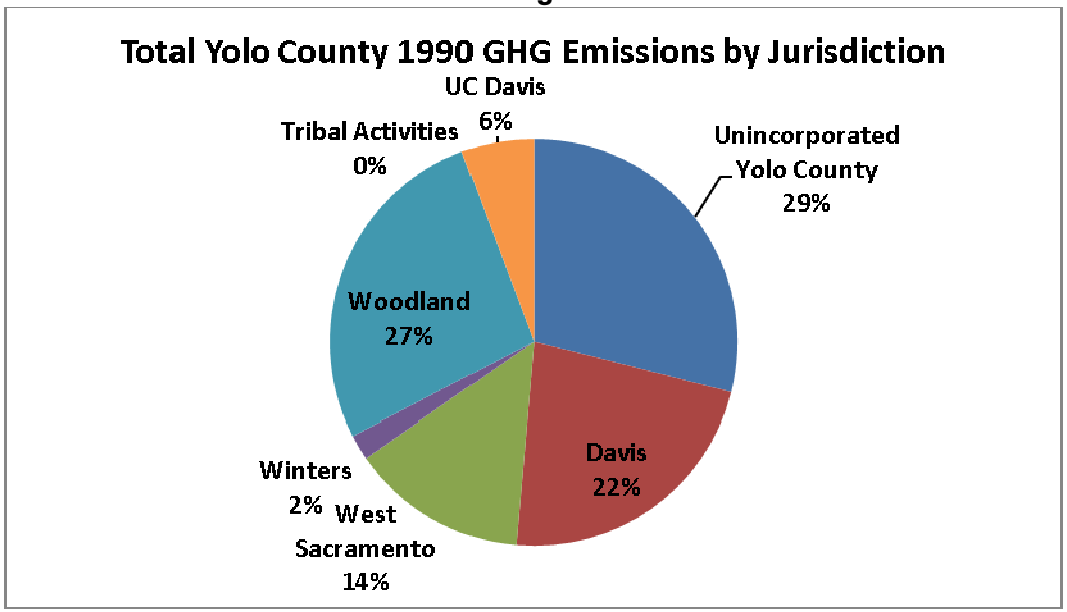


Figure A-6



for roadways in the unincorporated County, along with emission factors from EMFAC2007 by speed bin (i.e., portion of vehicle miles traveled [VMT] that would occur within a range of 5 mile per hour increments). HPMS data for 1990 was used in combination with data prepared by Fehr & Peers (2010) from the Yolo County General Plan Traffic Demand Forecasting (TDF) model, which included 2005 VMT data by speed bin. The dataset obtained from Fehr & Peers accounted for trips that did not originate or terminate in the county by apportioning 50% of VMT and associated GHG emissions to Yolo County for internal-to-external trips, and external-to-internal trips. VMT, and associated GHG emissions, resulting from internal-to-internal trips were allocated 100% to Yolo County. This methodology is consistent with the Regional Target Advisory Committee (RTAC) recommendations in response to Senate Bill (SB) 375.

These data were used to develop a correction factor that was then applied to the 1990 Caltrans dataset to achieve a more accurate 1990 VMT number. Another correction was applied to the Caltrans dataset in order to allocate a percentage of VMT that would occur on state highways where the origin and destination were both located within the unincorporated County, based on 1990 population.

Solid Waste

GHG emissions related to solid waste disposal were calculated using a first-order

decay modeling method from EPA for the Yolo County Central Landfill (YCCL). Waste characterization data for the unincorporated County and for the UCD landfill were obtained from the 1991 *Yolo County Waste Generation Study*. Solid waste disposal-related emissions were apportioned to the incorporated areas using population data contained in the solid waste disposal study.

Agriculture

Agricultural sources of GHG emissions include off-road farm equipment, irrigation pumps, residue burning, livestock, pesticide application, rice cultivation, and fertilizer volatilization. The activity data for Yolo County's agricultural sector were obtained from a variety of sources as discussed in detail below. GHG emission factors associated with farming equipment in 1990 were obtained from OFFROAD2007. The GHG emission factor for agricultural irrigation pumps and the number of pumps in the county were obtained from ARB's GHG emissions inventory (ARB 2006, ARB 2003). Fertilizer application data for 1990 were obtained from the University of California, Davis, Agriculture and Resource Economics Department *Current Cost and Return Studies* (UCD 2010a). Emission factors and methods to quantify GHG emissions associated with fertilizer application were obtained from ARB's GHG emissions inventory (ARB 2007). Calendar year 1990 activity data for acres of rice and other crops cultivated and livestock populations in Yolo County were obtained from Yolo County's 1990 *Annual Crop Report* (Yolo County 1990). GHG emissions associated with lime and urea application were obtained from UCD. Emission factors and quantification methodologies for enteric fermentation (i.e., livestock digestive processes) and manure management were obtained from the ARB's GHG emissions inventory (ARB 2007). Documentation of agricultural-related GHG emissions by source type is available online and by request from the Yolo County Planning and Public Works Department.

Wastewater Treatment

Methane emissions from wastewater treatment facilities were calculated using process data (e.g., treatment capacity, biological oxygen demand) for the three wastewater treatment facilities that serve unincorporated Yolo County. Ascent obtained this information from Esparto, Knights Landing, and Madison Community Service District Waste Discharge Requirements facility permit records from the Central Valley Regional Water Quality Control Board, based on documents in effect in 1990.

The GHG emissions associated with wastewater treatment processes were quantified using methods and emission factors from IPCC for centralized, aerobic wastewater treatment plants, which is representative of processes at these facilities in 1990 (IPCC 2006b).

Other Sources

Construction & Mining

Ascent calculated 1990 GHG emissions from construction and mining activities within unincorporated Yolo County in the historic inventory using emission factors and inventory data from the OFFROAD model. It was not possible to allocate emissions to the respective activities because the OFFROAD model is equipment-based, rather than activity-based. Thus, it was not possible to determine which pieces of equipment in the OFFROAD model were used for construction and which were used for mining. Please note that this sector only includes emissions associated with the on-site use of heavy-duty equipment. Emissions associated with the land uses themselves (e.g., off-site transportation and energy use) are included in the other sectors as applicable. Also, for the sake of clarification, the issue of fugitive particulate matter dust emissions, which is typically associated with mining activities, is not addressed in this inventory as such are not classified as GHGs.

Stationary Sources

GHG emissions from stationary sources within the County in 1990 were calculated using facility permit data obtained from YSAQMD. The permit data contained fuel consumption activity information from which GHG emissions were calculated using CCAR emission factors. Stationary-source emissions were heavily influenced

by permitted facilities that burned wood/biomass in 1990. CCAR recommends treatment of wood combustion sources as biogenic (i.e., originating from living organisms) emissions and are included in the historic inventory for informational purposes. GHG emissions associated with agricultural processing facilities were itemized separately within this sector.

In addition, the OFFROAD model was used to obtain heavy-duty equipment emissions associated with industrial land uses within the County in 1990.

University of California, Davis
Emissions from UCD (for the Davis campus) were calculated for 1990 in the *2009-2010 Climate Action Plan* and were estimated at 120,991 MT CO_2e/year (UCD 2010b). Emissions for the Davis campus in 2008 were estimated at 162,775 MT CO_2e/year. In addition, Ascent calculated GHG emissions from the UCD landfill in 1990 (4,725 MT CO_2e/year) using the same methods described above for the 1990 solid waste sector for the historic inventory.

Tribal Activities
GHG emissions associated with activities on tribal trust land for the Yocha Dehe Wintun Nation were modeled using the Urban Emissions Model (URBEMIS 2007 version 9.2.4) and population data obtained from County staff. Emissions from tribal activities were estimated to be 439 MT CO_2e/year in 1990.

Port of Sacramento
The GHG emissions inventory for West Sacramento is currently in the preparation process, and is anticipated to include GHG emissions from activities at the Port of Sacramento. However, emissions estimates for the Port were not available at this time.

Yolo Bypass
GHG emissions from agricultural production in the Bypass were included in the Agricultural sector. The Yolo Bypass was federally designated in 1997, therefore, GHG emissions that occurred in this area in during 1990 were under the County's jurisdiction, and were included in the County's 1990 Historic inventory.

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Appendix B

Emissions Reduction Quantifications

Appendix B describes the emissions reduction quantification for 2020 and 2030. The quantification for each year is described in a separate subsection. Unless noted, all reduction percentages, participation rates, and other scale factors are applied to the relevant sector or subsector emissions in the specified year.

2020 EMISSIONS REDUCTIONS

Table B-1: Summary of Emission Reductions per Measure in 2020

Measure	Description	MT CO_2e/year reduced in 2020
A-1	Reduce nitrogen fertilizer application rates	4,132
A-2	Reduce fossil fuel consumption in field equipment	1,142
A-3	Reduce energy use in agricultural irrigation pumping	9,396
A-4	Reduce confined livestock manure methane emissions	12,370
A-5	Reduce methyl bromide application	36
A-6	Sequester carbon in agricultural landscapes	2,527
Transportation and Land Use	General Plan Policies contained in the Land Use and Circulation Elements	42,018
E-1	Pursue a community choice aggregation program	117,285
E-2	Reduce energy consumption in existing residential and non-residential buildings	3,948
E-3	Reduce energy consumption in new residential and nonresidential buildings	31,852
E-4	Increase on-site renewable energy generation to reduce demand for grid energy	24,870
E-5	Promote on-farm renewable energy facilities	316
E-6	Reduce water consumption in existing buildings through increased plumbing fixture efficiency	2,103
E-7	Promote weather-based irrigation systems and water efficient turf management	51
WR-1	Expand landfill methane capture systems	9,366
Total		**261,412**

AGRICULTURE

A-1: Reduce nitrogen fertilizer application rates

This measure assumes that nitrogen fertilizer application rates in Yolo County will decrease by an average of 6% below 2008 application rates by 2020. UC Davis research identifies a potential to reduce nitrogen fertilizer application rates 25% below current (2008) levels. The County assumes a conservative 6% reduction for 2020.

% Reduction	Inventory Sector	Inventory Sub-sector	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
6%	29.3% (agriculture)	24.4% (fertilizer)	0.4%	**4,132**

Source: De Gryze, Steven, Rosa Catala, Richard E. Howitt, and Johan Six (University of California, Davis). 2008. Assessment of Greenhouse Gas Mitigation in California Agricultural Soils. California Energy Commission, PIER Energy-Related Environmental Research. CEC-500-2008-039.

A-2: Reduce fossil fuel consumption in field equipment

Operation and Maintenance Improvements: This measure component assumes 5% of farm equipment increases fuel efficiency by 6% through improvements to operation and maintenance.

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
6%	29.3% (agriculture)	25.4% (farm equipment)	5%	0.0%	221

Source: Svejkovsky, Cathy. 2007. Conserving Fuel on the Farm. ATTRA—National Sustainable Agriculture Information Service, National Center for Appropriate Technology.

Engine Conversions*:* This measure component assumes that 25% of farm equipment increases fuel efficiency by 5% through improvements to engines (conversion from older model to Tier IV engines).

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
5%	29.3% (agriculture)	25.4% (farm equipment)	25%	0.1%	921
Total					**1,142**

Source: Alternative Energy Newswire. 2010. New Holland Agriculture and Fiat Powertrain Launching Tier4 Tractors Based on SCR Technology. Available at: www.alternativeenergynewswire.com/new-holland-agriculture-and-fiat-powertrain-launching-tier4-tractors-based-on-scr-technology

Combined, the operation and maintenance improvements and engine conversion components have the potential to reduce field equipment GHG emissions by 1,142 MT CO_2e/year.

A-3: Reduce energy use in agricultural irrigation pumping

Agricultural Irrigation Pump Efficiency: This measure component assumes that 10% of agricultural groundwater pumps ranging from 50-175 horsepower would improve pump bowl efficiency for an average of 33% reduction in energy (electricity or diesel) consumed.

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
33%	29.3% (agriculture)	13.9% (agricultural pumps)	10%	0.1%	1,331

Source: Peter Canessa and John Weddington. 2006. Program Thesis and Design for a Diesel Pumping Efficiency Program. Center for Irrigation Technology - California State University, Fresno.

Solar agricultural irrigation pumps: This measure assumes that 40% of agricultural irrigation return pumps (around 10 horsepower) would switch to solar power for 100% of energy consumed.

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
50%	29.3% (agriculture)	13.9% (agricultural pumps)	40%	0.8%	8,065

Source: Information regarding solar provided by stakeholders at the Yolo County Climate Action Plan – Agriculture, Rural, and Open Space Stakeholders Workshop, 2010.

Combined, the agricultural irrigation pump efficiency and solar agricultural irrigation pump components have the potential to reduce field equipment GHG emissions by **9,396** MT CO_2e/year.

A-4: Reduce confined livestock manure methane emissions

This measure assumes that 100% of confined livestock facilities (i.e., dairies) in Yolo County will implement biogas control systems that reduce methane emissions by 90% by 2020.

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
90% (methane control efficiency)	29.3% (agriculture)	14% (livestock)	33.9% of livestock (100% of dairy cattle)	1.2%	**12,370**

Source: Ascent Environmental Inc, 2010.

A-5: Methyl bromide reduction

This measure assumes that use of the pesticide methyl bromide eliminated out by 2020 per the requirements of the Montreal Protocol.

% Reduction	Inventory Sector	Inventory Sub-sector	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
100%	29.3% (agriculture)	0.0% (pesticide application)	0.0%	**36**

Source: The Phase-out of Methyl Bromide. US Environmental Protection Agency. Accessed October 1st 2010. http://www.epa.gov/ozone/mbr/

A-6: Sequester carbon in agricultural landscapes

Riparian Forest Restoration: This measure component assumes that 1,100 acres of riparian forest will be planted within Yolo County between 2010 and 2020.

Average Carbon Storage Rate (MT C/acre/yr)	Acres Restored between 2010 and 2020	Annual Carbon Storage Potential (MT C/year)	Ratio of MT CO_2e to MT C	Annual Carbon Storage Potential (MT CO_2/year)
0.54634	1,100	600.97	3.66667	2,204

Wood Carbon Stock at Saturation (MT C/hectare)	Wood Carbon Stock at Saturation (MT C/acre)	Years at Riparian Forest C Saturation	Average Carbon Storage Rate (MT C/acre/yr)
108	43.71	80	0.54634

Source: The Carbon Online Estimator: COLE 1605(b), Report for California filtered for Forest Type: Cottonwood, Willow, Cottonwood / willow. COLE Development Group. USDA. Accessed October 7th 2010. http://www.ncasi2.org/COLE/

Hedgerows: This measure component assumes that 7.27 acres (5 miles x 12 feet wide) of hedgerow have been or will be established per year within Yolo County and a total of 174.5 acres are established between 1997 and 2020.

Average Carbon Storage Rate (MT C/acre/yr)	Acres Restored in between 1996 and 2020	Annual Carbon Storage Potential (MT C/year)	Ratio of MT CO2e to MT C	Annual Carbon Storage Potential (MT CO_2/year)
0.50587	174.5	88.3	3.66667	324

Wood Carbon Stock of Hedgerows in Smukler Study (MT C/hectare)	Wood Carbon Stock of Hedgerows in Smukler Study (MT C/acre)	Estimated age of Hedgerows in Smukler Study	Estimated Years to Hedgerow C Saturation	Wood Carbon Stock at Saturation (MT C/acre)	Average Carbon Storage Rate (MT C/acre/yr)
18.75[+]	7.59	15	30	15.18	0.50587

Source: Smukler, S.M. et al. 2010. Biodiversity and multiple ecosystem functions in an organic farmscape. Agriculture, Ecosystems and Environment. 139 (80–97); Estimate of hedgerow establishment provided by Yolo County Resource Conservation District, 2010.

Combined, the components of Measure A-6 have the potential to store **2,527** MT CO_2/year. The carbon storage potential of permanent crops was not applied toward the 2020 reduction target.

TRANSPORTATION

Reduction potential of General Plan transportation and land use policies

The County's General Plan set a performance standard for new development of 44 vehicle miles traveled per household per day (VMT/HH/day). Exhibit IV.C-3 of the County's GP EIR showed 83 VMT/HH/day in 2005, forecast to reduce to 77 VMT/HH/day in 2035 under no project (Exhibit IV.C-4). The County assumed the following levels of compliance with the performance standard for new development within each community:

Area	% of GP growth	% compliance with VMT standard	VMT/HH/day	% reduction	weighted % reduction
Dunnigan SP	44.4%	100%	44	42.9%	19.0%
Elkhorn SP	17.7%	33%	70	9.1%	1.6%
Esparto	8.4%	50%	64	16.9%	1.4%
Madison SP	7.6%	60%	67	13.0%	1.0%
Knights Landing	5.0%	25%	73	5.2%	0.3%
Covell	0.0%	0%	77	0.0%	0.0%
Total					23.3%

The anticipated VMT reduction associated with this performance standard was estimated at 23.3%.

% Reduction	Inventory Sector	Inventory Sub-sector	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
23.3%	28.7% (transportation)	63.1% (transportation emissions from new growth)	4.2%	**42,018**

Source: VMT Data from Fehr and Peers. 2010. Growth allocation assumptions from Yolo County Planning Staff.

ENERGY

E-1: Pursue a community choice aggregation program

This measure assumes that 10% of the customers in Yolo County would stay with PG&E's portfolio, which was assumed to have complied with the 20% renewable electricity standard by year 2020. 75% of the county would purchase a "light green" portfolio with 50% renewable electricity, and 15% of the county would purchase a "deep green" portfolio at 100% renewable electricity.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
30%	34.4% (electricity)	75%	7.7%	76,490
80%	34.4% (electricity)	15%	4.1%	40,795
Total			12.1%	**117,285**

Source: Participation rates are based on County Staff estimates. Light Green percent reduction mirrors efforts of the proposed San Francisco CCA program (51% renewable by 2017). The Deep Green percent reduction mirrors Marin County's current Deep Green tier (100% renewable).

E-2: Reduce energy consumption in existing residential buildings

Note that this measure applies the scaled reduction to 2008 energy sector emissions to isolate existing building energy from total 2020 building energy.

Existing Residential Buildings: This measure component assumes that 20% of existing (2008) residential units in the county would implement efficiency improvements that reduce energy consumption by 15%.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
15%	5.4% (residential energy)	20%	0.2%	959

Source: Coito, Fred and Mike Rufo. 2003. California Statewide Residential Sector Energy Efficiency Potential Study, Study ID #SW063, Final Report, Volume 1 of 2, Main Report. Prepared for Pacific Gas & Electric Company by KEMA-XENERGY Inc. Oakland, California. Participation rates are based on estimates made by County staff and consultants.

Existing Non-Residential Buildings: This measure component assumes that 10% of existing (2008) commercial buildings in the county would reduce their energy consumption by 20%.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
20%	25.2% (commercial energy)	10%	0.5%	2,989

Source: Coito, Fred and Mike Rufo. 2003. California Statewide Commercial Sector Energy Efficiency Potential Study, Study ID #SW039A, Final Report, Volume 1 of 2, Main Report. Prepared for Pacific Gas & Electric Company by KEMA-XENERGY Inc. Oakland, California. Participation rates are based on estimates made by County staff and consultants.

Combined, the components of Measure E-2 have the potential to reduce **3,948** MT CO_{2e}/year.

E-3: Reduce energy consumption in new residential and non-residential buildings

Note that this measure applies the scaled reduction to new building 2020 energy emissions. To obtain this value, 2008 building energy emissions are subtracted from total 2020 building energy emissions.

New Residential Buildings: This measure component assumes that 88% of new buildings in the County would exceed Title 24 standards by 15% (i.e., California Green Building Code [CGBC] Tier I standards), and that 10% of new residential units would be larger than 3,500 square feet and thus be required to exceed Title 24 standards by 30% (i.e., CGBC Tier II standards). Finally, this assumes that 2% would voluntarily exceed Title 24 standards by 30% (i.e., CGBC Tier II standards).

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
15%	24% (residential energy in new construction)	88%	0.7%	7,019
30%	24% (residential energy in new construction)	12%	0.2%	1,914
Total			0.9%	8,933

Source: The 15% reduction is based on proposed County Building Standards for all residential and non-residential construction. A County Building Standard will require all residential units over 3,500 square feet to exceed Title-24 by 30%. The participation rates and the voluntary performance level are based on estimates made by County Staff and consultants.

New Non-Residential Buildings: This measure component assumes that in compliance with the County's building energy standards, 98% of new commercial construction in the County would exceed Title 24 standards by 15% and that 2% of new commercial buildings would voluntarily exceed Title 24 standards by 30% (i.e., CGBC Tier II standards).

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
15%	76%(commercial energy in new construction)	98%	2.2%	21,898
30%	76% (commercial energy in new construction)	2%	0.1%	1,021
Total			2.3%	22,919

Source: The 15% reduction is based on proposed County Building Standards for all residential and non-residential construction. The assumption that 2% of new commercial buildings will voluntarily exceed current Title-24 by 30% is an estimate made by County staff and consultants.

Combined the components of Measure E-3 have the potential to reduce **31,852** MT CO_2e/year.

E-4: Increase on-site renewable energy generation to reduce demand for grid energy

Solar Water Heaters: This measure component assumes 100% of new residential and commercial units in the County would reduce 70% and 40% of water-heating-related energy use by installing solar water heaters, respectively. The measure also assumes while 15% of existing residential units would install solar water heaters and reduce water-heating-related energy use by 70% and that 5% of existing commercial units would reduce water-heating-related energy use by 40% each.

% Reduction	Inventory Sector	Participation Rate	Scale Factor	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
70%	1.5% (residential natural gas)	100%	44% (portion of natural gas used for water heating)	0.1%	1,025
70%	1.5% (residential natural gas)	15%	44% (portion of natural gas used for water heating)	0.1%	125
40%	14.5% (commercial natural gas)	100%	44% (portion of natural gas used for water heating)	0.5%	5,000
40%	14.5% (commercial natural gas)	5%	44% (portion of natural gas used for water heating)	0.1%	232
Total				0.7%	6,382

Source: Del Chiaro, Bernadette. 2007. Solar Water Heating: How California Can Reduce Its Dependence on Natural Gas. Environment California Research & Policy Center. Los Angeles, CA. The 100% participation rate for new construction reflects the establishment of a proposed requirement to include SHW systems on all new development. The voluntary participation rates are estimates made by County staff and consultants.

Photovoltaic Systems: This measure component assumes that 100% of new residential and commercial units within the County would replace 10% of their grid-derived electricity consumption with on-site solar photovoltaic generation. This measure component also assumes that 5% of existing residential units within the County would replace 10% of their grid-derived electricity consumption with on-site solar photovoltaic generation. It is also assumed that owners of existing commercial buildings install 200,000 square feet of solar photovoltaic panels.

% Reduction	Portion of Energy Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
10%	22.3% (residential electricity)	100%	0.5%	4,984
10%	22.3 % (residential electricity)	5%	0.1%	202
10%	61.7% (commercial electricity)	100%	1.2%	12,056
Total			1.8%	17,242

Source: The 100% participation rate for new construction reflects the establishment of a proposed requirement to include PV systems in all new development that provides 10% of the total electricity demand. The voluntary participation rates and percent reduction are estimates made by County staff and consultants.

System Efficiency (W/sq ft)	Annual System Efficiency (kWh/sq ft/yr)	Square feet of solar panels	Estimated generation (MWh/yr)	Emissions factor (MT CO_2e/MWh)	GHG Reduction Potential (MT CO_2e/year)
10.00	21.60	200,000	4,320	0.288488	1,246

Combined, the components of Measure E-4 are expected to reduce GHG emissions by **24,870** MT CO_2e/year.

E-5: Promote on-farm renewable energy facilities

This measure assumes that 1 megawatt of renewable energy generation capacity will be developed on farms and ranches within Yolo County. This measure does not include the solar irrigation pumps indentified in Measure A-3.

Generation Capacity (MW)	Hours of Generation per Year	Efficiency	Annual Generation (MWh)	Emissions factor (MT CO_2e/MWh)	GHG Reduction Potential (MT CO_2e/year)
1	2,190	50%	1,095	0.288488	**316**

Source: The 1 MW of generation capacity by 2020 is an estimate made by County staff and consultants. No sources available.

E-6: Reduce water consumption in existing buildings through plumbing fixture efficiency

Plumbing Fitting and Fixture Efficiency Retrofits: This measure component assumes that 100% of existing built prior to 1990 residential units would improve water fixture and fitting efficiency by 15%.

% Reduction	Inventory Sector	Participation Rate	Scale Factor	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
15%	1.2% (residential water consumption)	100%	92% (% of households build prior to 1990)	0.164%	1,618

Water leak repair: This measure component assumes that 40% of residential and commercial units in the County would repair water leaks, which would reduce water consumption by 6%.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
6%	1.2% (residential water consumption)	40%	0.028%	281
6%	0.9% (commercial water consumption)	40%	0.021%	204
Total			0.049%	485

Source: Gleick, Peter H. et al. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California. Pacific Institute. Oakland, California. Participation rates are estimates made by County staff and consultants.

Combined, the components of Measure E-6 are expected to reduce GHG emissions by **2,103** MT CO_2e/year.

E-7: Promote weather-based irrigation systems and water efficient turf management

This measure assumes that 2% of residential and 5% of commercial units in the County would reduce landscape-related water consumption by 20% through use of weather-based irrigation systems that detect and manage soil moisture.

% Reduction	Inventory Sector	Participation Rate	Scale Factor	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
20%	1.2% (residential water consumption)	2%	39% (portion of outdoor water use)	0.0%	18
20%	0.9% (commercial water consumption)	5%	39% (portion of outdoor water use)	0.0%	33
Total				0.0%	**51**

Source: Hunt,Theodore et al. 2001. Residential Weather-Based Irrigation Scheduling: Evidence from the Irvine "ET Controller" Study. Irvine Ranch Water District; Chesnutt, Thomas and Dana Holt. 2006. Commercial ET-Based Irrigation Controller Water Savings Study. Prepared by A & N Technical Services, Inc. for Irvine Ranch Water District and The U.S. Department of the Interior's Bureau of Reclamation. Participation rates are estimates made by County staff and consultants.

SOLID WASTE

WR-1: Expand landfill methane capture systems

This measure assumes that methane capture of 90% efficiency would be implemented at the County landfill, which is a 15% increase over the existing assumption of 75% capture.

Solid Waste GHG Emissions in 2020 (75% methane capture) (MT CO_2e/yr)	% Reduction	GHG Reduction (MT CO_2e/yr)
12,660	73%	9,366

2030 EMISSIONS REDUCTION QUANTIFICATION

Table B-2: Summary of Emission Reductions per Measure in 2030

Measure	Description	MT CO_2e/year reduced in 2030
A-1	Reduce nitrogen fertilizer application rates	10,054
A-2	Reduce fossil fuel consumption in field equipment	2,903
A-3	Reduce energy use in agricultural irrigation pumping	18,949
A-4	Reduce confined livestock manure methane emissions	12,035
A-5	Reduce methyl bromide application	36
A-6	Sequester carbon in agricultural landscapes	60,033
Transportation and Land Use	General Plan Policies contained in the Land Use and Circulation Elements	84,035
E-1	Pursue a community choice aggregation program	145,884
E-2	Reduce energy consumption in existing residential and non-residential buildings	12,322
E-3	Reduce energy consumption in new residential and nonresidential buildings	67,200
E-4	Increase on-site renewable energy generation to reduce demand for grid energy	52,032
E-5	Promote on-farm renewable energy facilities	632
E-6	Reduce water consumption in existing buildings through increased plumbing fixture efficiency	4,100
E-7	Promote weather-based irrigation systems and water efficient turf management	862
WR-1	Expand landfill methane capture systems	13,649
Total		**484,727**

AGRICULTURE

A-1: Reduce nitrogen fertilizer application rates

This measure assumes that nitrogen fertilizer application rates in Yolo County agriculture will decrease by an average of 15% below 2008 application rates by 2030. UC Davis research identifies a potential to reduce nitrogen fertilizer application rates 25% below current (2008) levels.

% Reduction	Inventory Sector	Inventory Sub-sector	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
15%	20.3% (agriculture)	24.4% (fertilizer)	0.7%	**10,051**

Source: De Gryze, Steven, Rosa Catala, Richard E. Howitt, and Johan Six (University of California, Davis). 2008. Assessment of Greenhouse Gas Mitigation in California Agricultural Soils. California Energy Commission, PIER Energy-Related Environmental Research. CEC-500-2008-039.

A-2: Reduce fossil fuel consumption in field equipment

Operation and Maintenance Improvements: This measure component assumes 5% of farm equipment increases fuel efficiency by 6% through improvements to operation and maintenance. The assumptions are the same for 2020 and 2030.

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
6%	29.3% (agriculture)	25.4% (farm equipment)	5%	0.0%	215

Source: Svejkovsky, Cathy. 2007. Conserving Fuel on the Farm. ATTRA—National Sustainable Agriculture Information Service, National Center for Appropriate Technology.

Engine Conversions*:* This measure component assumes that by 2030 75% of farm equipment increases fuel efficiency by 5% through improvements to engines (conversion from older model to Tier IV engines or better).

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
5%	29.3% (agriculture)	25.4% (farm equipment)	75%	0.2%	2,688

Source: Alternative Energy Newswire. 2010. New Holland Agriculture and Fiat Powertrain Launching Tier4 Tractors Based on SCR Technology. Available at: www.alternativeenergynewswire.com/new-holland-agriculture-and-fiat-powertrain-launching-tier4-tractors-based-on-scr-technology

Combined, the operation and maintenance improvements and engine conversion components have the potential to reduce field equipment GHG emissions by **2,903** MT CO_2e/year.

A-3: Reduce energy use in agricultural irrigation pumping

Agricultural Irrigation Pump Efficiency: This measure component assumes that 10% of agricultural groundwater pumps ranging from 50-175 horsepower would improve pump bowl efficiency for an average of 33% reduction in energy (electricity or diesel) consumed. The assumptions are the same for 2020 and 2030.

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
33%	29.3% (agriculture)	13.9% (agricultural pumps)	10%	0.1%	1,295

Source: Peter Canessa and John Weddington. 2006. Program Thesis and Design for a Diesel Pumping Efficiency Program. Center for Irrigation Technology - California State University, Fresno.

Solar agricultural irrigation pumps: This measure assumes that 90% of agricultural tailwater-return pumps (around 10 horsepower) would switch to solar power for 100% of energy consumed.

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
50%	29.3% (agriculture)	13.9% (agricultural pumps)	90%	1.25%	17,654

Source: Information regarding solar irrigation pumps provided by stakeholders at the Yolo County Climate Action Plan – Agriculture, Rural, and Open Space Stakeholders Workshop, 2010.

Combined, the agricultural irrigation pump efficiency and solar agricultural irrigation pump components have the potential to reduce field equipment GHG emissions by **18,949** MT CO_2e/year.

A-4: Reduce confined livestock manure methane emissions

This measure assumes that 100% of confined livestock facilities (i.e., dairies) in Yolo County will implement biogas control systems that reduce methane emissions by 90% in 2030. The assumptions are the same for 2020 and 2030.

% Reduction	Inventory Sector	Inventory Sub-sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
90% (methane control efficiency)	29.3% (agriculture)	14% (livestock)	33.9% of livestock (100% of dairy cattle)	0.9%	**12,035**

Source: Ascent Environmental Inc, 2010.

A-5: Methyl bromide reduction

This measure assumes that use of the pesticide methyl bromide eliminated out by 2020 per the requirements of the Montreal Protocol. The assumptions are the same for 2020 and 2030.

% Reduction	Inventory Sector	Inventory Sub-sector	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
100%	29.3% (agriculture)	0.0% (pesticide application)	0.0%	**36**

Source: The Phase-out of Methyl Bromide. US Environmental Protection Agency. Accessed October 1st 2010. http://www.epa.gov/ozone/mbr/

A-6: Sequester carbon in agricultural landscapes

Riparian Forest Restoration: This measure component assumes that 2,000 acres of riparian forest will be planted within Yolo County between 2010 and 2030.

Average Carbon Storage Rate (MT C/acre/yr)	Acres Restored between 2010 and 2020	Annual Carbon Storage Potential (MT C/year)	Ratio of MT CO_2e to MT C	Annual Carbon Storage Potential (MT CO_2/year)
0.54634	2,000	1092.68	3.66667	4,006

Wood Carbon Stock at Saturation (MT C/hectare)	Wood Carbon Stock at Saturation (MT C/acre)	Years at Riparian Forest C Saturation	Average Carbon Storage Rate (MT C/acre/yr)
108	43.71	80	0.54634

Source: The Carbon Online Estimator: COLE 1605(b), Report for California filtered for Forest Type: Cottonwood, Willow, Cottonwood / willow. COLE Development Group. USDA. Accessed October 7th 2010. http://www.ncasi2.org/COLE/

Hedgerows: This measure component assumes that 7.27 acres (5 miles x 12 feet wide) of hedgerow has been or will be established per year within Yolo County and a total of 247.3 acres are established between 1997 and 2030.

Average Carbon Storage Rate (MT C/acre/yr)	Acres Restored in between 1997 and 2020	Annual Carbon Storage Potential (MT C/year)	Ratio of MT CO_2e to MT C	Annual Carbon Storage Potential (MT CO_2/year)
0.50587	247.3	125.08	3.66667	459

Wood Carbon Stock of Hedgerows in Smukler Study (MT C/hectare)	Wood Carbon Stock of Hedgerows in Smukler Study (MT C/acre)	Estimated age of Hedgerows in Smukler Study	Estimated Years to Hedgerow C Saturation	Wood Carbon Stock at Saturation (MT C/acre)	Average Carbon Storage Rate (MT C/acre/yr)
18.75[+]	7.59	15	30	15.18	0.50587

Source: Smukler, S.M. et al. 2010. Biodiversity and multiple ecosystem functions in an organic farmscape. Agriculture, Ecosystems and Environment. 139 (80–97); Estimate of hedgerow establishment provided by Yolo County Resource Conservation District, 2010.

Permanent Crops: This measure component reflects the trend toward permanent crops (e.g., orchards) and away from some field crops. According to the Agricultural Commissioner, John Young, this trend is expected to continue through 2030. County staff estimated the percent increase in permanent crops expected over the planning horizon, which is summarized in the following table:

Permanent Crop Growth Assumptions

Increase in permanent crops type	Percent increase by 2030	# acres	# trees/ac (or vines)	# new trees (or vines)	# of new permanent trees (or vines)[1]
Almonds	10%	1,146	200	229,200	114,600
Walnut	10%	891	26	23,166	23,166
Olives	new establishment	2,860	1,000	2,860,000	2,860,000
Wine Grapes	20%	2,401	470	1,128,470	1,128,470

[1] It was assumed that the fates of walnut and olive orchards and wine grape vineyards was chipping and compost at the end of the orchard's life. It was also assumed that 50% of almond orchards are chipped and composted at the end of life, and the other 50% is used for firewood. Thus, 50% of almond trees were treated as permanent crops.

Source: Yolo County Agricultural Commissioner 2010.

A method from the U.S. Department of Energy-Energy Information Administration was used to calculate the quantity of carbon that would be permanently sequestered in the new orchard trees within the County during the CAP planning horizon. The methodology did not include sequestration potential of vines, thus, carbon sequestration from wine grapes could not be calculated at this time. The method for fast-growing hardwoods was followed for almonds, walnuts, and olive trees, and the sequestration rate for walnut trees was used as a surrogate for almond and olive trees, since rates specific to those species were not available. It was assumed that the total net increase of 2,997,766 almond, walnut, and olive trees would be planted evenly over the next 20 years (approximately 142,751 new 15-gallon trees per year). The carbon sequestration method includes statistical Survival Factors for trees of different ages (assuming that a 15 gallon tree is age 0). Thus, the potential for trees to die (i.e., "reversals") was accounted for in this methodology. The following table summarizes the method to calculate the net increase in the County's orchard-related carbon sequestration through 2020 and 2030.

According to this methodology, the increase in orchard crops anticipated in Yolo County would sequester approximately 17,660 MT CO_2e/year in year 2020 and approximately 55,570 MT CO_2e/year in 2030. This methodology provides a simple, conservative estimate of carbon sequestration in orchard crops, but is not intended to be used for carbon offset purposes. The research and methods for calculating carbon sequestration are dynamic and controversial. For these reasons the sequestration potential was not applied to the 2020 GHG reduction target.

Permanent Crop orchard-related carbon sequestration

Year	Tree Age	# Trees Planted	Survival Factor	# Surviving Trees	Annual sequestration rate (lb carbon/tree)	carbon sequestered (lb carbon)
2010	0	142,751	0.873	124,621	2.7	336,478
2011	1	142,751	0.798	113,915	4.0	455,660
2012	2	142,751	0.736	105,065	5.4	567,349
2013	3	142,751	0.706	100,782	6.9	695,396
2014	4	142,751	0.678	96,785	8.5	822,673
2015	5	142,751	0.658	93,930	10.1	948,693
2016	6	142,751	0.644	91,931	11.8	1,084,792
2017	7	142,751	0.630	89,933	13.6	1,223,089
2018	8	142,751	0.616	87,934	15.5	1,362,984
2019	9	142,751	0.602	85,936	17.4	1,495,286
2020	10	142,751	0.589	84,080	19.3	1,622,748
2021	11	142,751	0.576	82,224	21.3	1,751,381
2022	12	142,751	0.563	80,369	23.3	1,872,590
2023	13	142,751	0.551	78,656	25.4	1,997,854
2024	14	142,751	0.539	76,943	27.5	2,115,923
2025	15	142,751	0.527	75,230	29.7	2,234,321
2026	16	142,751	0.516	73,659	31.9	2,349,735
2027	17	142,751	0.505	72,089	34.1	2,458,239
2028	18	142,751	0.495	70,662	36.3	2,565,017
2029	19	142,751	0.484	69,091	38.6	2,666,927
2030	20	142,751	0.474	67,664	41.0	2,774,218
Total at 2030		2,997,766	-	1,821,500	-	33,401,351
					Total CO_2 sequestered at 2030 (MT CO_2/year)	**55,568**

Notes: carbon sequestered from 2010-2020 was summed and converted from carbon to CO_2 using a factor of 44/12 (the molecular weight of CO_2/C).
Assumes trees are 15 gallons at age 0.
Does not include sequestration by 50% of almond orchard trees or by wine grape vines.

Source: U.S, Department of Energy, Energy Information Administration. 1998 (April). Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings.

Combined, the components of Measure A-6 have the potential to store **60,033** MT CO_2/year.

TRANSPORTATION

Reduction potential of General Plan transportation and land use policies

The County's General Plan set a performance standard for new development of 44 vehicle miles traveled per household per day (VMT/HH/day). Exhibit IV.C-3 of the County's GP EIR showed 83 VMT/HH/day in 2005, forecast to reduce to 77 VMT/HH/day in 2035 under no project (Exhibit IV.C-4). The County assumed the following levels of compliance with the performance standard for new development within each community:

Area	% of GP growth	% compliance with VMT standard	VMT/HH/day	% reduction	weighted % reduction
Dunnigan SP	44.4%	100%	44	42.9%	19.0%
Elkhorn SP	17.7%	33%	70	9.1%	1.6%
Esparto	8.4%	50%	64	16.9%	1.4%
Madison SP	7.6%	60%	67	13.0%	1.0%
Knights Landing	5.0%	25%	73	5.2%	0.3%
Covell	0.0%	0%	77	0.0%	0.0%
Total					23.3%

The anticipated VMT reduction associated with this performance standard was estimated at 23.3%.

% Reduction	Inventory Sector	Inventory Sub-sector	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
23.3%	33.6% (transportation)	77.4% (transportation emissions from new growth)	6.1%	**84,035**

Source: VMT Data from Fehr and Peers. 2010. Growth allocation assumptions from Yolo County Planning Staff.

ENERGY

E-1: Pursue a community choice aggregation program

This measure assumes that 5% of the customers in Yolo County would stay with PG&E and that the utility achieves the 33% renewable electricity generation portfolio required by Executive Order # S-14-08. It is also assumed that 80% of the County would purchase a "light green" portfolio with 50% renewable electricity, and 15% of the County would purchase a "deep green" portfolio at 100% renewable electricity.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
22%	34.4% (electricity)	80%	6.7%	92,859
67%	34.4% (electricity)	15%	3.8%	53,025
Total			10.5%	**145,884**

Source: Participation rates are based on County Staff estimates. Light Green percent reduction mirrors efforts of the proposed San Francisco CCA program (51% renewable by 2017). The Deep Green percent reduction mirrors Marin County's current Deep Green tier (100% renewable).

E-2: Reduce energy consumption in existing residential buildings

Note that this measure applies the scaled reduction to 2008 energy sector emissions to isolate existing building energy from total 2020 building energy.

Existing Residential Buildings: This measure component assumes that 70% of existing (2008) residential units in the county would implement efficiency improvements that reduce energy consumption by 15%.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
15%	5.4% (residential energy)	70%	0.6%	3,357

Source: Coito, Fred and Mike Rufo. 2003. California Statewide Residential Sector Energy Efficiency Potential Study, Study ID #SW063, Final Report, Volume 1 of 2, Main Report. Prepared for Pacific Gas & Electric Company by KEMA-XENERGY Inc. Oakland, California. Participation rates are based on estimates made by County staff and consultants.

Existing Non-Residential Buildings: This measure component assumes that 30% of existing (2008) commercial buildings in the county would reduce their energy consumption by 20%.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
20%	25.4% (commercial energy)	30%	1.5%	8,966

Source: Coito, Fred and Mike Rufo. 2003. California Statewide Commercial Sector Energy Efficiency Potential Study, Study ID #SW039A, Final Report, Volume 1 of 2, Main Report. Prepared for Pacific Gas & Electric Company by KEMA-XENERGY Inc. Oakland, California. Participation rates are based on estimates made by County staff and consultants.

Combined, the components of Measure E-2 have the potential to reduce **12,322** MT CO_2e/year.

E-3: Reduce energy consumption in new residential and non-residential buildings

Note that this measure applies the scaled reduction to new building 2020 energy emissions. To obtain this value, 2008 building energy emissions are subtracted from total 2030 building energy emissions.

New Residential Buildings: This measure component assumes that 88% of new buildings in the county would exceed Title 24 standards by 15% (i.e., California Green Building Code [CGBC] Tier I standards), and that 10% of new residential units would be larger than 3,500 square feet and thus be required to exceed Title 24 standards by 30% (i.e., CGBC Tier II standards). Finally, this assumes that 2% would voluntarily exceed Title 24 standards by 30% (i.e., CGBC Tier II standards).

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
15%	24% (residential energy in new construction)	88%	1.0%	14,124
30%	24% (residential energy in new construction)	12%	0.3%	3,852
Total			1.3%	17,976

Source: The 15% reduction is based on proposed County Building Standards for all residential and non-residential construction. A County Building Standard will require all residential units over 3,500 square feet to exceed Title-24 by 30%. The participation rates and the voluntary performance level are based on estimates made by County Staff and consultants.

New Non-Residential Buildings: This measure component assumes that in compliance with the County's building energy standards, 98% of new commercial construction in the County would exceed Title 24 standards by 15% and that 2% of new commercial buildings would voluntarily exceed Title 24 standards by 30% (i.e., CGBC Tier II standards).

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
15%	76% (commercial energy in new construction)	98%	3.4%	47,185
30%	76% (commercial energy in new construction)	2%	0.1%	2,039
Total			3.5%	49,224

Source: The 15% reduction is based on proposed County Building Standards for all residential and non-residential construction. The assumption that 2% of new commercial buildings will voluntarily exceed current Title-24 by 30% is an estimate made by County staff and consultants.

Combined, the components of Measure E-3 have the potential to reduce **67,200** MT CO_2e/year.

E-4: Increase on-site renewable energy generation to reduce demand for grid energy

Solar Water Heaters: This measure component assumes 100% of new residential and commercial units in the county would reduce 70% and 40% of water-heating-related energy use by installing solar water heaters, respectively. The measure also assumes while 15% of existing residential units would install solar water heaters and reduce water-heating-related energy use by 70% and that 5% of existing commercial units would reduce water-heating-related energy use by 40% each.

% Reduction	Inventory Sector	Participation Rate	Scale Factor	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
70%	1.6% (residential natural gas)	100%	44% (portion of natural gas used for water heating)	0.2%	2,252
70%	1.6% (residential natural gas)	40%	44% (portion of natural gas used for water heating)	0.2%	366
40%	14.4% (commercial natural gas)	100%	44% (portion of natural gas used for water heating)	0.8%	10,685
40%	14.4% (commercial natural gas)	10%	44% (portion of natural gas used for water heating)	0.3%	459
Total				1.5%	13,762

Source: Del Chiaro, Bernadette. 2007. Solar Water Heating: How California Can Reduce Its Dependence on Natural Gas. Environment California Research & Policy Center. Los Angeles, CA. The 100% participation rate for new construction reflects the establishment of a proposed ordinance to require SHW systems in all new development. The voluntary participation rates are estimates made by County staff and consultants.

Photovoltaic Systems: This measure component assumes that 100% of new residential and commercial units within the County would replace 10% of their grid-derived electricity consumption with on-site solar photovoltaic generation. This measure component also assumes that 5% of existing residential units within the county would replace 10% of their grid-derived electricity consumption with on-site solar photovoltaic generation. It is also assumed that owners of existing commercial buildings install 200,000 square feet of solar photovoltaic panels.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
10%	22.3% (residential electricity)	100%	0.7%	9,969
10%	22.3 % (residential electricity)	10%	0.2%	405
10%	61.7% (commercial electricity)	100%	1.9%	26,027
Total			2.8%	36,401

Source: The 100% participation rate for new construction reflects the establishment of a proposed requirement to include PV systems in all new development that provides 10% of the total electricity demand. The voluntary participation rates and percent reduction are estimates made by County staff and consultants.

System Efficiency (W/sq ft)	Annual System Efficiency (kWh/sq ft/yr)	Square feet of solar panels	Estimated generation (MWh/yr)	Emissions factor (MT CO_2e/MWh)	GHG Reduction Potential (MT CO_2e/year)
10.00	21.60	300,000	6,480	0.288488	1,869

Combined, the components of Measure E-4 are expected to reduce GHG emissions by **52,032** MT CO_2e/year.

E-5: Promote on-farm renewable energy facilities

This measure assumes that 1 megawatt of renewable energy generation capacity will be developed on farms and ranches within Yolo County. This measure does not include the solar irrigation pumps identified in Measure A-3.

Generation Capacity (MW)	Hours of Generation per Year	Efficiency	Annual Generation (MWh)	Emissions factor (MT CO_2e/MWh)	GHG Reduction Potential (MT CO_2e/year)
2	2,190	50%	2,190	0.288488	**632**

Source: The 2 MW of generation capacity by 2030 is an estimate made by County staff and consultants.

E-6: Reduce water consumption in existing buildings through plumbing fixture efficiency

Plumbing Fitting and Fixture Efficiency Retrofits: This measure component assumes that 100% of existing residential units built prior to 1990 would improve water fixture and fitting efficiency by 20%.

% Reduction	Inventory Sector	Participation Rate	Scale Factor	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
20%	1.3% (residential water consumption)	100%	92% (% of households build prior to 1990)	0.24%	3,347

Water leak repair: This measure component assumes that 40% of residential and commercial units in the County would repair water leaks, which would reduce water consumption by 6%.

% Reduction	Inventory Sector	Participation Rate	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
6%	1.3% (residential water consumption)	40%	0.031%	436
6%	1.0% (commercial water consumption)	40%	0.023%	317
Total			0.054%	753

Source: Gleick, Peter H. et al. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California. Pacific Institute. Oakland, California. Participation rates are estimates made by County staff and consultants.

Combined, the components of Measure E-6 are expected to reduce GHG emissions by **4,100** MT CO_2e/year.

E-7: Promote weather-based irrigation systems and water efficient turf management

This measure assumes that 2% of residential and 5% of commercial units in the County would reduce landscape-related water consumption by 20% through use of weather-based irrigation systems that detect and manage soil moisture.

% Reduction	Inventory Sector	Participation Rate	Scale Factor	Scaled % Reduction	GHG Reduction Potential (MT CO_2e/year)
20%	1.3% (residential water consumption)	25%	39% (portion of outdoor water use)	0.0%	351
20%	1.0% (commercial water consumption)	50%	39% (portion of outdoor water use)	0.0%	510
Total				0.0%	**862**

Source: Hunt,Theodore et al. 2001. Residential Weather-Based Irrigation Scheduling: Evidence from the Irvine "ET Controller" Study. Irvine Ranch Water District; Chesnutt, Thomas and Dana Holt. 2006. Commercial ET-Based Irrigation Controller Water Savings Study. Prepared by A & N Technical Services, Inc. for Irvine Ranch Water District and The U.S. Department of the Interior's Bureau of Reclamation. Participation rates are estimates made by County staff and consultants.

SOLID WASTE

WR-1: Expand landfill methane capture systems

This measure assumes that methane capture of 90% efficiency would be implemented at the County landfill, which is a 15% increase over the existing assumption of 75% capture.

Solid Waste GHG Emissions in 2030 (75% methane capture) (MT CO_2e/yr)	% Reduction	GHG Reduction (MT CO_2e/yr)
18,449	73%	**13,649**

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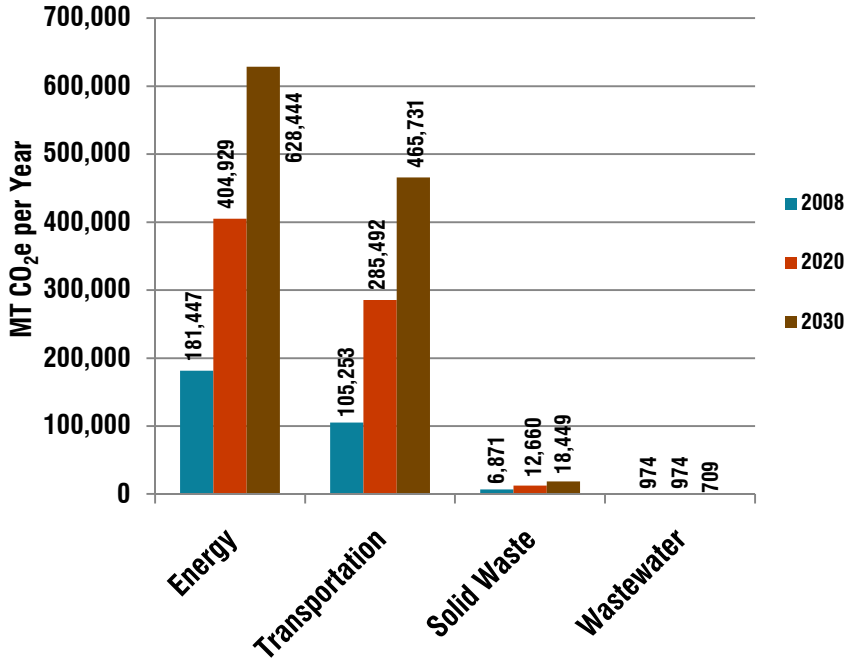
Appendix C

GHG Emissions in Future Development

The 2020 and 2030 projections indicate that over the next two decades, energy, transportation, and solid waste-related GHG emissions are expected to increase considerably in the unincorporated portions of Yolo County due primarily to planned residential, commercial, and industrial growth. This appendix describes the level of emissions projected to occur within the County's predicted growth areas and describes the emissions reduction potential for each. The methods used in this analysis are described at the end of the appendix.

Figure C-1: Energy, Transportation, Solid Waste, and Wastewater GHG Emissions 2008-2030



Growth Projections

Yolo County projects that by 2020, new planned development may accommodate 12,596 additional residents and 7,383 new employees. The General Plan focuses this new growth within the existing unincorporated communities, particularly in Dunnigan.

The proposed Dunnigan Specific Plan area will accommodate approximately 43% of the planned total growth within unincorporated Yolo County. The community of Elkhorn will accommodate 16% of new growth and Esparto, Knights Landing, and Madison will accommodate 6%, 4%, and 7% respectively. Other areas of unincorporated Yolo County, outside existing or planned communities will receive 23% of the projected development.

Table C-1: Growth Projections by Area

	2020		2030	
Area	New Population	New Jobs	Population	New Jobs
Dunnigan	5,595	2,939	11,189	5,877
Elkhorn	2,232	1,056	4,463	2,112
Esparto	1,063	212	2,125	424
Knights Landing	627	208	1,253	416
Madison	955	525	1,909	1,050
Other Unincorporated	2,127	2,444	4,253	4,887
Total	12,596	7,383	25,192	14,766

Source: Yolo County Planning, 2010

The County anticipates that the relative allocation of the growth in 2030 will remain the same as in 2020. By 2030, a total of 25,192 new residents and 14,766 new employees are expected to live and/or work within Yolo County.

Methodology for Growth Area Analysis

The 2020 and 2030 projections include emissions from existing development and future planned development. To examine the level of GHG emissions that future development alone will generate in 2020, the 2008 baseline emissions were subtracted from the 2020 projections. This calculation was done for each emissions sector related to development (i.e., energy, transportation, solid waste, and wastewater). The process was repeated with 2030 projections in order to determine the amount of emissions new development would create in 2030.

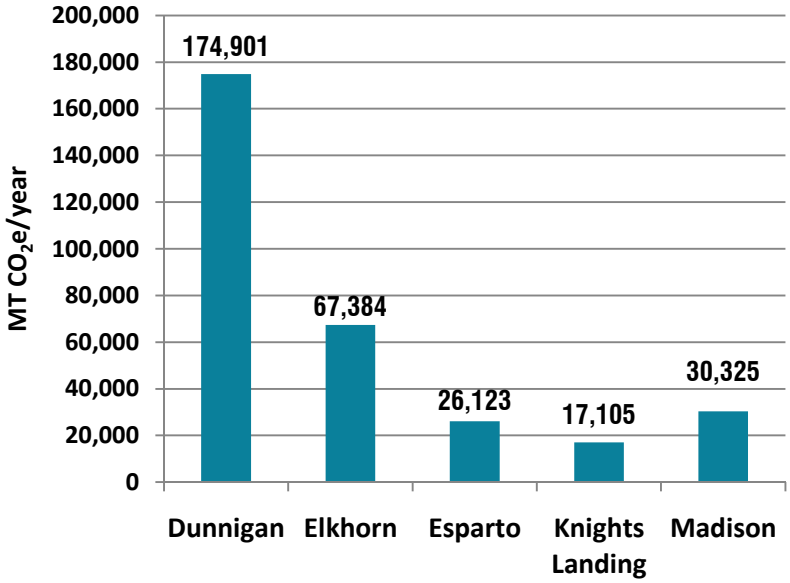
Once the emissions from new development were identified per sector, emissions were allocated to the different growth areas based on the percentage of growth expected to occur in each area. To determine the percentage of growth per area, the projected number of new residents and new employees per growth area were added and then divided this by the sum total for the unincorporated County.

After the emissions per sector for each growth area were established, the same methods as described in Appendix B were used to calculate the potential for reducing GHG emissions in new development. Reductions from Measures E-1, E-3, E-4, and W-1 and the Transportation and Land Use policies of the General Plan were applied.

GHG Emissions per Growth Area

For CAP planning purposes, increases in energy, transportation, solid waste and wastewater GHG emissions were attributed to new growth areas in proportion to the amount of population and employment growth anticipated for each location (see methodology section below). Figure C-2 demonstrates the GHG emissions associated with new development in each growth area. The Dunnigan Specific Plan area is expected to generate the most emissions (174,901 MT CO_2e/year in 2020) and represents an important opportunity for CAP reduction efforts. Development in the existing communities is expected to generate 67,384 MT CO_2e/year in Elkhorn, 26,123 MT CO_2e/year in Esparto, 17,105 MT CO_2e/year in Knights Landing, and 30,325 MT CO_2e/year in Madison.

Figure C-2: 2020 GHG Emissions from New Development by Growth Area



CAP Measures and New Development

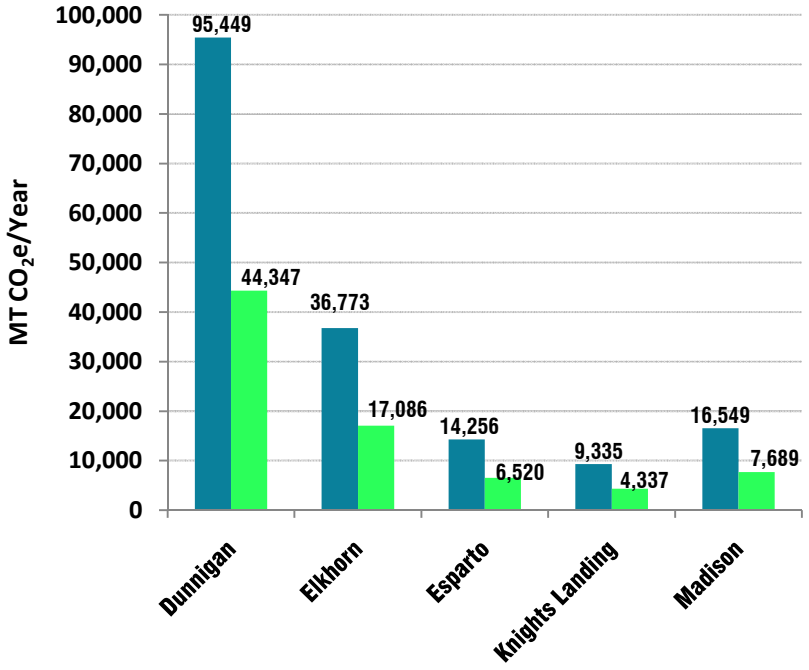
In order to achieve its adopted reduction target, the County will need to ensure that the new development minimizes GHG emissions. The General Plan contains a variety of policies and actions that will help reduce the emissions associated with new development, and this CAP provides specific measures that implement those policies and actions.

Energy

The CAP contains three measures aimed at reducing building energy-related GHG emissions in new development. Measure E-1 will allow new residents and businesses to participate in the County's proposed community choice aggregation program. Participation in the "light green program will allow customers to purchase 50% of their electricity from renewable sources. Participation in the "deep green" program will allow customers to purchase 100% renewable electricity. Measure E-3 requires all new residential (excluding affordable housing) and non-residential (after 2013) development to exceed existing California Enegy Code (Title-24) by 15%. Measure E-4 requires all new residential subdivisions (excluding affordable housing) and non-residential buildings (after 2013) to install solar water heaters. The measure also requires all residential subdivisions (excluding affordable housing) and non-residential development (after 2013) to install solar photovoltaic systems capable of producing 10% of the development's anticipated electricity demand.

Figure C-3 demonstrates the level of energy-related GHG emisisons within each growth area in 2020. The blue bars indicate the business-as-usual projected levels and the green bars indicate the mitigated emissions level resulting from implementation of the CAP measures. The measures result in a 54% reduction in energy-related GHG emissions in each growth area.

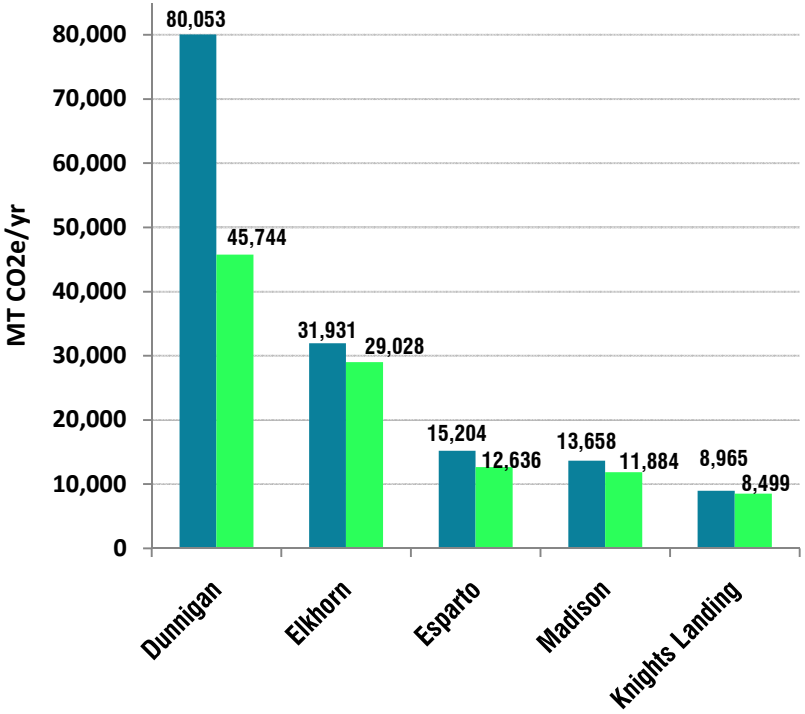
Figure C-3: Energy-Related GHG Emisisons by Growth Area 2020



Transportation and Land Use

General Plan Policy CI-3.19 requires all new development in the Dunnigan Specific Plan area to achieve 44 vehicle miles traveled per day per household. The fact that the Dunnigan Specific Plan area will be a new community offers an opportunity to develop land use patterns, urban design, and transportation infrastructure in such a way so as to reduce transportation-related emissions. General Plan Policy CI-3.21 directs new growth in other towns within the unincorporated area to strive to achieve 44 VMT per day per household to the extent feasible. Unlike the Dunnigan Specific Plan requirement, this is an objective rather than a performance standard. These policies are discussed in more detail on Pages 40 to 48. Figure C-4 demonstrates that while the Dunnigan Specific Plan Area will generate the most transportation-related emissions, the plan is also capable of significant emission reductions (approximately 34,308 MT CO_2e/year or 43%). New growth in the existing communities of Elkhorn, Esparto, Madison, Knights Landing will be able to achieve reductions of 2,902 MT CO_2e/year (9%), 2,566 MT CO_2e/year (17%), 1,774 MT CO_2e/year (13%), and 466 MT CO_2e/year (5%) respectively.

Figure C-4: Transportation-Related GHG Emissions by Growth Area 2020



Solid Waste

Measure WR-1 will expand methane capture and control systems at the County landfill and reduce methane emissions associated with waste disposal. While new development will not directly implement this measure, the waste-related GHG emissions from new development will be reduced as a result. The measure will reduce solid waste emissions by 51% in all growth areas.

Overall Reductions

Combined, the CAP measures have the potential to reduce GHG emissions considerably in Yolo County's new growth areas.

Implementation of the CAP energy and solid waste measures and the General Plan transportation and land use policies within the Dunnigan Specific Plan will result in a reduction of 89,042 MT CO_2e/year or 51% below projected levels. New growth in the existing communities of Elkhorn, Esparto, Knights Landing, and Madison will be able to achieve reductions of 23,074 MT CO_2e/year (34%), 10,490 MT CO_2e/year (40%), 6,894 MT CO_2e/year (40%), and 9,543 MT CO_2e/year (31%) respectively.

Figure C-5: Solid Waste-Related GHG Emissions by Growth Area 2020

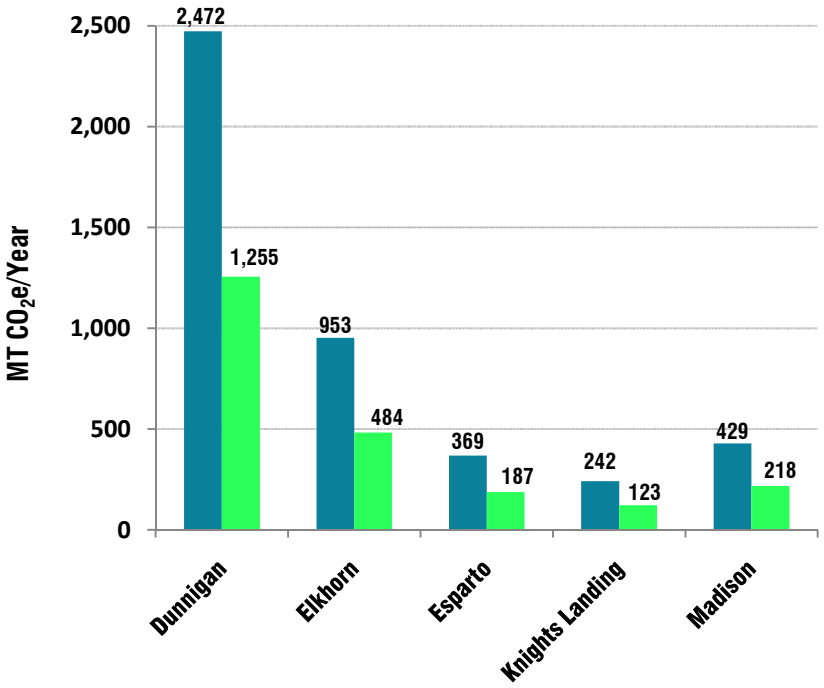
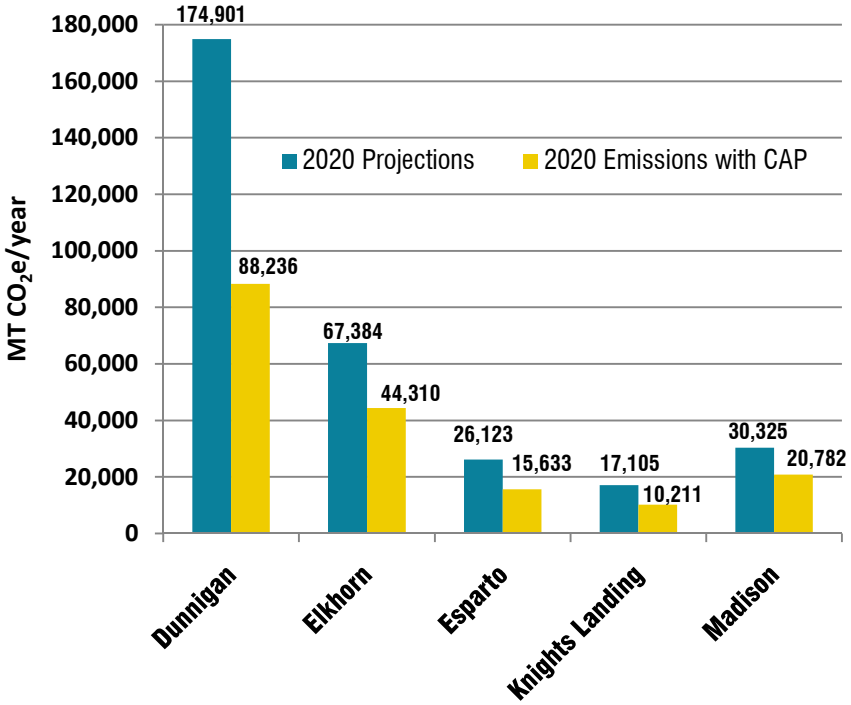


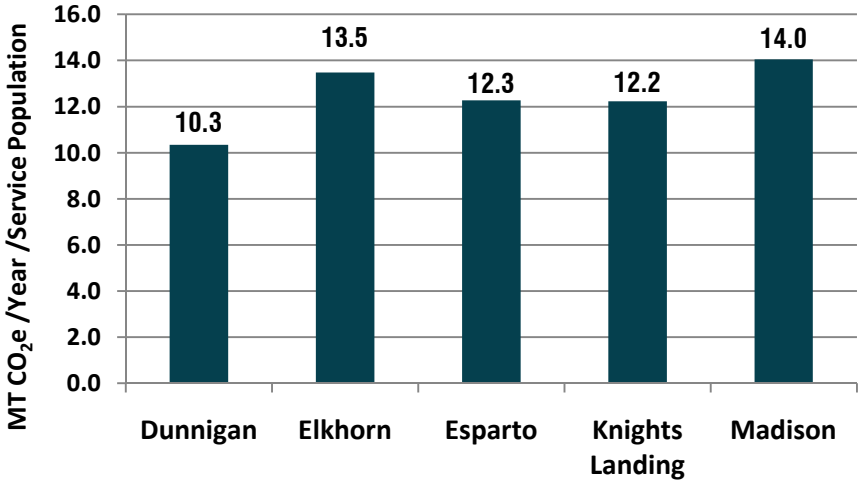
Figure C-6: 2020 GHG Emissions from New Development by Growth Area



Efficiency of New Development

The efficiency of new development can be evaluated by examining the GHG emissions that will be generated in a growth area and dividing this by the number of new residents and employees that the growth area will accommodate. The sum of residents and employees is often referred to as the service population. These efficiency levels can be compared between growth areas. Figure C-7 demonstrates that the Dunnigan Specific Plan is likely to be the most efficient growth area. The reduction in transportation related emissions are the primary factor behind the Dunnigan Specific Plan's high level of GHG reduction compared to the other communities. Locating new growth in this comparatively efficient location will serve to reduce the County's future GHG emissions.

Figure C-7: 2020 GHG Emissions with CAP Reductions per Service Population by Growth Area



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Appendix D

Economic Methods and Assumptions

INTRODUCTION

Economics were a key consideration in determining the feasibility of proposed GHG reduction measures. Costs and, where applicable, savings to the resident, business, or farmer were assessed for a selected number of high reduction potential measures. Governmental agency, academic institution, and private industry sources, as well as analyses conducted by AECOM were used in the analysis.

COSTS & SAVINGS

A costs and savings analysis was performed for a selected number of implementation measures included in the CAP. Measures vary in the distribution of costs; some measures require funding from the County or other public entities, whereas others will result in increased costs to residents, businesses, and/or farmers. In nearly all measures that require some investment by the private sector, there are long-term savings that allow recuperation of initial investments, as well as other benefits such as improved air quality. Some measures require no private investment, but generate savings for residents, business owners, or farmers.

Cost to Resident, Business or Farm

Although many measures do not have private costs, the economic implications of these measures to the resident, business, or farm owner merit analysis and quantification, where possible. The cost analysis for private entities is described as annual costs (or average annual costs), total costs, and per unit costs (specific units defined per measure). While several measures have mandatory costs (i.e. energy performance standards for new construction), others are voluntary (i.e., energy efficiency retrofits). However, funding sources and financing mechanisms are available to help offset these expenditures. To provide a comparable assessment of costs, calculations are based on a hypothetical average building, business, or farm. Where the variation in size is too considerable to overlook, per unit costs are provided that can be extrapolated to a range of building, business, or farm sizes. For nearly every measure with cost implications, savings would accrue over time, defraying some of the initial investment.

Savings to Resident, Business or Farm

The savings analysis for residents, businesses, or farms is presented in terms of annual savings, as many savings would be recurring. Not all measures generate savings, though many that deal with energy or water efficiency in homes or businesses generate long-term utility bill savings. Farm operational efficiency can also generate savings through decreased inputs for agricultural production. To provide a comparable assessment of savings, calculations are based on a hypothetical average building, business, or farm.

AGRICULTURE: Measure A-1					
Measure	**Progress Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
A-1: Reduce nitrogen fertilizer application rates	**Nitrogen Fertilizer application reduction** Reduce average nitrogen fertilizer application rates by 6% below current (2010) levels.	**Cost Type**	*Ongoing Operation Cost*	Example crops: Alfalfa, Corn, Rice, Safflower Tomato, Wheat, Tomatoes Calculations are based on production acreage, tonnage, and value estimates from 2007-2008. Calculations are based on average relative changes in yield (%) of 25% reduction in fertilizer application compared to conventional practices (conventional tillage, 100% mineral fertilizer, and no cover crop) for the Sacramento Valley. Values are averages over individual fields and for the period 1997–2006. Crops are grown in typical rotations. Values are biophysical potentials that do not reflect practical limitations of combining practices. Gain (+) or Loss (-) in productivity due to 25% reduction in fertilizer application: – Alfalfa: 0.35% – Corn: -0.20% – Rice: -0.03% – Safflower: -12.90% – Tomato: -4.00% – Wheat: -0.10% Changes in agricultural production will have impacts on individual farmers, as well as agricultural infrastructure, processing, storage, and transportation.	Yolo County 2008 Agricultural Crop Report CEC & UC Davis: *Assessment of Greenhouse Gas Mitigation in California Agricultural Soils* AECOM
		Annual Cost	**Estimated Impact on Yolo County Agriculture:** – Alfalfa: $219,000 production value gain with $540,000 of savings = $719,000 net gain – Corn: $16,000 production value loss with $398,000 of savings = $382,000 net gain – Rice: $13,000 production value loss with $823,000 of savings = $810,000 net gain – Safflower: $636,000 production value loss with $110,000 of savings = $526,000 net loss – Tomato: $4,110,000 production value loss with $1,913,000 of savings = $2,197,000 net loss – Wheat: $43,000 production value loss with $975,000 of savings = $932,000 net gain		
		Total Cost	N/A		
		Per Unit Cost	**Per Acre Impact (individual farmers):** – Alfalfa: $4 production value gain with $10 of savings – Corn: $2 production value loss with $40 of savings – Rice: $0 production value loss with $26 of savings – Safflower: $56 production value loss with $10 of savings – Tomato: $103 production value loss with $48 of savings – Wheat: $1 production value loss with $25 of savings		

AGRICULTURE: Measure A-2					
Measure	**Progress Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
A-2: Reduce fossil fuel consumption in field equipment	**Tractor operation efficiency** 5% of farm equipment increases fuel efficiency by 6% through improvements to operation and maintenance improvements.	**Cost Type**	*Ongoing Operation Cost*	**Tractor Efficiency** – *Make sure your thermostat works properly.* A properly working thermostat saves energy. Most engines run most efficiently when water temperature is between 165° F and 180° F. Fuel consumption increases by approximately 25% when the engine is operating at 100° F, instead of 180° F. – *Minimize idling, which can account for 15% to 20% of total fuel used.* Letting an engine idle for 10 minutes during an average day, or 61 hours a year, will use about 31 gallons of fuel on a 75-horsepower diesel tractor. – *Avoid quick starts—they waste fuel and are hard on equipment.* Keeping farm vehicles and equipment in top operating condition will save fuel and money, help reduce repair costs, improve reliability, and minimize harmful exhaust emissions. Common maintenance measures include getting regular tune-ups; replacing air, oil and fuel filters routinely; changing oil; and using the proper grade of oil. – *Ensure that gas caps fit properly.* Caps that are damaged, loose, or missing altogether will cause fuel to vaporize. – *Reduce excess weight on vehicles.* Lighter loads consume less fuel than heavier ones. Keep your tires properly inflated. Having just one tire under-inflated by six pounds per square inch (psi) can increase fuel consumption by 3%, not to mention reducing the tire's life. – *Have wheels aligned and balanced.* Proper alignment and balance—like proper air pressure—help minimize resistance from tires, which can reduce fuel economy.	National Sustainable Agriculture Information Service - Conserving Fuel on the Farm http://attra.ncat.org/attra-pub/farm_energy/conserving.html
		Annual Cost			
		Total Cost			
		Per Unit Cost	Cost savings to negligible costs if efficiency is achieved through basic operational and maintenance improvements.		

AGRICULTURE: Measure A-2					
Measure	**Progress Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
A-2: Reduce fossil fuel consumption in field equipment	**Tractor operation efficiency** 25% of farm equipment increases fuel efficiency by 5% through improvements to equipment (conversion from older model to Tier IV engines)	**Cost Type**	*Initial Capital Cost*	**Tier IV Tractor Engines** Only Caterpillar has estimated prices for Tier IV equipment, calculating it will add 12% to engine costs over the next three years. Other manufacturers have indicated that likely price increases will be in the 3% to 5% range. This extra cost purchases cleaner burning engines that are more efficient, and consumes 15% to 20% less fuel than pre-Tier equipment built just 12 years ago. John Deere Base Price (Tier III compliant) – 6115D Cab Tractor: $54,000 – 7130 Open Operator Station Tractor: $64,000 – 8235R Tractor: $195,000 – 8360R Tractor : $295,000 – 8360RT Tractor: $305,000 – 9430T Tractor: $323,000 – 9530T Tractor: $343,000 – 9360 Tractor: $326,000	www.agriculture.com/machinery/meer-cleer-leer-engines_197-ar10177 John Deere www.deere.com/en_US/ProductCatalog/FR/category/FR_TRACTORS.html
		Annual Cost	If financed through a commercial loan (~5% interest rate, 20 years): ~$33 to $330 dollars per month, assuming no subsidies or discounts.		
		Total Cost	N/A		
		Per Unit Cost	Approximate 10-15% premium on Tier IV tractor engines compared to Tier III. For a range of tractor prices from $50,000 to $325,000, this price premium translates to $5,000 to $50,000 on the purchase of a new Tier IV tractor compared to Tier III tractors.		

AGRICULTURE: Measure A-3					
Measure	**Performance Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
A-3: Reduce energy use in agricultural irrigation pumping	**Pump repair or upgrade** 10% of groundwater pumps improve pump bowl efficiency for an average 33% reduction in energy (electricity or diesel) consumed.	**Cost Type**	*Ongoing Operating Cost*	**Assumes a typical groundwater pump:** **Low Range:** – 50 horsepower – 500 gallons per minutes (GPM) (700 GPM after retrofit) – 50 Discharge Pressure (psi) – 50% Overall Plant Efficiency (OPE) (83% OPE after retrofit) – 2,000 hours of operation per year **High Range:** – 175 horsepower – 800 gallons per minutes (GPM) (1,000 GPM after retrofit) – 50 Discharge Pressure (psi) – 50% Overall Plant Efficiency (OPE) (83% OPE after retrofit) – 2,000 hours of operation per year	Center of Irrigation Technology - CSU Fresno - Agricultural Pumping Efficiency Program www.pumpefficiency.org/Pumptesting/costanalysis.asp AECOM
		Annual Cost	**50-horsepower (low range) - 195 acre-feet per year (at 2,000 annual hours of operation):** Annual Cost per Acre-Foot of Water: ~$17,000/year (current condition) and ~$10,000 (after retrofit) = ~$7,000 of savings **175-horsepower (high range) - 295 acre-feet per year (at 2,000 annual hours of operation):** Annual Cost per Acre-Foot of Water: ~$26,000/year (current condition) and ~$16,000 (after retrofit) = ~$10,000 of savings		
		Total Cost	Retrofit and/or repair costs will vary considerably depending on the current groundwater pump system.		
		Per Unit Cost	**50-horsepower (low range):** Average Cost per Acre-Foot of Water: $88 (current condition at 50% OPE) and $53 (after retrofit at 83% OPE) = Savings of $35/acre foot/year **175-horsepower (high range):** Average Cost per Acre-Foot of Water: $88 (current condition at 50% OPE) and $53 (after retrofit at 83% OPE) = Savings of $35/acre foot/year		

AGRICULTURE: Measure A-3					
Measure	**Mechanism**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
A-3: Reduce energy use in agricultural irrigation pumping	**Solar irrigation pumps** 40% of tailwater-return pumps switch to a solar electric energy source providing 100% of pumping energy.	**Cost Type**	*Initial Capital Cost*	**Range of costs per unit of energy and per system (installed, and maintenance costs):** – The cost of a solar water pumping system will vary depending on the capacity of the system. Generally, solar water pumping systems range in cost from $2,000 - $6,000. **Expected Payback:** – Solar water pumping is an economical and low maintenance alternative to a generator or extending the grid to un-serviced areas. Where the upfront costs of a grid extension are greater than the cost of the solar water pumping system (usually 0.25 mile or further), the savings are immediate and ongoing with minimal maintenance costs. While the upfront costs are generally greater than a gas-fuelled generator-based water pumping system, savings are met over 5 - 10 years or sooner in maintenance and fuel costs.	Integration of Renewable Energy on Farms www.farm-energy.ca WorldWater and Power Corporation www.worldwatersolar.com Conergy www.conergy.us
		Annual Cost	If financed through a commercial loan (~5% interest rate, 20 years): ~$13 - $40 dollars per month (not including tax and rebate benefits)		
		Total Cost	N/A		
		Per Unit Cost	~$2,000 to $6,000 per 10 horsepower solar irrigation unit (costs per acre-foot will vary depending on the utilization of the pump) **Potential Rebates** Rebate of up to 40% of installed cost Federal Tax Credit of 10% California State Tax Credit of 7.5% 5 Year Accelerated Tax Depreciation Renewable Energy Credits Sustained Asset Value with 25 year PV Module Warrantees		

AGRICULTURE: Measure A-4					
Measure	**Performance Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
A-4: Reduce confined livestock manure methane emissions	**Confined livestock manure management** Reduction of 90% manure methane emissions from 100% of confined livestock operations.	**Cost Type**	*Initial Capital Cost (does not include annual operation and maintenance costs)*	**EPA - Managing Manure with Biogas Recovery Systems Improved Performance at Competitive Costs** – Note that 1,000 pounds Steady State Live Weight (SSLV) = approximately 1 mature cow – Covered lagoon digesters with open storage ponds: $150-$400 per 1,000 SSLV – Heated digesters with open storage tanks: $200-$400 per 1,000 pounds SSLV – Aerated lagoons with open storage ponds: $200-$450 per 1,000 pounds SSLV – Separate treatment lagoons and storage ponds: $200-$400 per 1,000 pounds SSLV – Combined treatment lagoons and storage ponds: $200-$400 per 1,000 pounds SSLV – Storage ponds and tanks: $50-$500 per 1,000 pounds SSLV **Agricultural and Resource Economics North Carolina State University** – New System Cost per 1,000 pounds SSLV per year: $86.81 – Standardized Feeder-to-Finish Farm with 4,320 head – 10-Year Amortization, Pit-Recharge, N-limited Irrigation onto Forages Range: – Across Farm Sizes and Types (Pit-Recharge): $43.24 To $189.07 / 1,000 lbs. SSLW / yr. – Across Farm Sizes and Types (Flush): $43.32 To $190.84 / 1,000 lbs. SSLW / yr.	EPA - Managing Manure with Biogas Recovery Systems Improved Performance at Competitive Costs www.epa.gov/agstar/pdf/manage.pdf Agricultural and Resource Economics North Carolina State University - Cost and Returns Analysis of Manure Management Systems Evaluated in 2004 under the North Carolina Attorney General Agreements with Smithfield Foods, Premium Standard Farms, and Front Line Farmers
		Annual Cost	N/A		
		Total Cost	N/A		
		Per Unit Cost	$50-450 per 1,000 pounds Steady State Live Weight (SSLV) depending on manure management system employed. If subsequent analysis determines that the cost in Yolo County is prohibitively high, subsidies and other incentives may be needed to support implementation.		

ENERGY: Measure E-2					
Measure	**Progress Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
E-2: Reduce Energy Consumption in Existing Residential and Non-Residential Buildings	**Energy efficiency building envelope retrofits** 20% of existing residential units reduce energy consumption by 15%	**Cost Type**	*Initial Capital Cost*	– Costs will vary based on the size, age, condition, and design of the building and site. Total costs shown are for a representative 2,000 square foot house. – Based on the cost of implementing basic, cost-effective energy conservation measures, which achieve an average of ~15% energy efficiency improvement for existing residential (pre-1980). These energy conservation measures include (and will vary depending on building type): attic and duct insulation, high efficiency heating system, and high efficiency lighting. – The building owner could leverage additional rebate and financing options to offset some costs.	AECOM Sustainable Systems Integration Model (SSIM) Energy Sub-Model Residential Energy Consumption Survey (RECS) California Energy Commission www.consumerenergycenter.org PG&E www.pge.com/tariffs/rateinfo.shtml
		Annual Cost	If financed through a home equity loan (~5% interest rate, 30 years): ~$5-8 dollars per month		
		Total Cost	Initial Capital Cost: $1,000 - $1,500 Average Annual Savings: $200 - $300		
		Per Unit Cost	Initial Capital Cost: $0.50 - $0.75/sq. ft. Average Annual Savings: $0.10 - $0.15/sq. ft.		

ENERGY: Measure E-2					
Measure	**Performance Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
E-2: Reduce Energy Consumption in Existing Residential and Non-Residential Buildings	**Energy efficiency building envelope retrofits** 10% of existing commercial buildings reduce energy consumption by 20%	**Cost Type**	*Initial Capital Cost*	– Costs will vary based on the size, age, condition, and design of the building and site. Total costs shown are for a representative 10,000 square foot commercial building (this building is hypothetical and is not considered the typical building in Yolo County). Generally, the per square foot cost of energy efficiency retrofits will not vary considerably with building size. – Based on the cost of implementing basic, cost-effective energy conservation measures, which achieve an average of ~20% energy efficiency improvement for a typical commercial building. These energy conservation measures include (and will vary depending on building type): high efficiency heating and cooling system, variable frequency drives, high efficiency lighting system, lighting controls, low flow fixtures, and high efficiency hot water boiler. – The building owner could leverage additional rebate and financing options to offset some costs.	AECOM Sustainable Systems Integration Model (SSIM) Energy Sub-Model Commercial Building Energy Consumption Survey (CBECS) California Energy Commission www.consumerenergycenter.org PG&E www.pge.com/tariffs/rateinfo.shtml
		Annual Cost	If financed through a commercial loan (~6% interest rate, 20 years): ~$290-$720 dollars per month		
		Total Cost	Initial Capital Cost: $40,000 - $100,000 Average Annual Savings: $5,000 - $15,000		
		Per Unit Cost	Initial Capital Cost: $4.00 - $10.00/sq. ft. Average Annual Savings: $0.50 - $1.50/sq. ft.		

ENERGY: Measure E-4					
Measure	**Performance Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
E-4: Reduce Energy Consumption in New Residential and Non-Residential Buildings	**Minimum performance standards for new construction** 100% of new residential units below 4,000 sq. ft. at 15% above Title 24 standards (CGBC Tier I) 100% of new residential units above 4,000 sq. ft. at 30% above Title 24 standards (CGBC Tier II) 2% of new residential buildings achieve exemplary performance (CGBC Tier II) and 0.5% of new residential buildings achieve zero-net energy demand.	**Cost Type**	*Developer Cost*	– Costs incurred by complying with Tier I standards would be born primarily by the developer and project financier. The following information is directed at that target audience, though the economic category to the left pertains solely to the resident. Residents would likely experience negligible to minimal additional costs from the application of this standard on new development, as the price of a building is more determined by market forces than building and construction costs. – Costs will vary based on the size and design of the building and site. Total costs shown are for a representative 2,000 square foot house. – Based on the cost of implementing basic, cost-effective energy conservation measures, which achieve an average of ~15% energy efficiency improvement for residential. These energy conservation measures include (and will vary depending on building type): attic and duct insulation, high efficiency windows, high efficiency heating and cooling system, high efficiency lighting, Energy Star washer, dishwasher, and refrigerator, and code compliant hot water boiler. – The building owner could leverage additional rebate and financing options to offset costs.	AECOM Sustainable Systems Integration Model (SSIM) Energy Sub-Model Residential Energy Consumption Survey (RECS) California Energy Commission - 2008 Building Energy Efficiency Standards for Residential and Nonresidential Buildings www.energy.ca.gov/2008publications/CEC-400-2008-001/CEC-400-2008-001-CMF.PDF PG&E www.pge.com/tariffs/rateinfo.shtml
		Annual Cost	N/A		
		Total Cost	Initial Capital Cost: $1,000 - $2,000 Average Annual Savings: $200 - $600		
		Per Unit Cost	Initial Capital Cost: $0.50 - $1.00/sq. ft. Average Annual Savings: $0.10 - $0.30/sq. ft.		

ENERGY: Measure E-4					
Measure	**Performance Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
E-4: Reduce Energy Consumption in New Residential and Non-Residential Buildings	**Minimum performance standards for new construction** 100% of new commercial construction at 15% above Title 24 standards. 2% of new commercial buildings achieve exemplary performance (CGBC Tier II) and 0.5% of new commercial buildings achieve zero-net energy demand.	**Cost Type**	*Developer Cost*	– Costs incurred by complying with a 15% energy efficiency improvement standard would be borne primarily by the developer and project financier. The following information is directed at that target audience, though the economic category to the left pertains solely to the building tenant. Tenants would likely experience negligible to minimal additional leasing costs from the application of this standard on new development, as leasing rates for a commercial building are more determined by market forces than building and construction costs. – Costs will vary based on the size and design of the building and site. Total costs shown are for a representative 10,000 square foot commercial building. – Based on the cost of implementing basic, cost-effective energy conservation measures, which achieve an average of 15% energy efficiency improvement for a typical commercial building. These energy conservation measures include (and will vary depending on building type): high efficiency heating and cooling system, variable frequency drives, high efficiency lighting system, lighting controls, low flow fixtures, and high efficiency hot water boiler. – The building owner could leverage additional rebate and financing options to offset costs.	AECOM Sustainable Systems Integration Model (SSIM) Energy Sub-Model Commercial Building Energy Consumption Survey (CBECS) California Energy Commission - 2008 Building Energy Efficiency Standards for Residential and Nonresidential Buildings www.energy.ca.gov/2008publications/CEC-400-2008-001/CEC-400-2008-001-CMF.PDF PG&E www.pge.com/tariffs/rateinfo.shtml
		Annual Cost	N/A		
		Total Cost	Initial Capital Cost: $15,000 - $30,000 Average Annual Savings: $1,500 - $4,000		
		Per Unit Cost	Initial Capital Cost: $1.50 - $3.00/sq. ft. Average Annual Savings: $0.15 - $0.40/sq. ft.		

ENERGY: Measure E-7					
Measure	**Performance Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
E-7: Increase On-site Renewable Energy Generation to Reduce Demand for Grid Energy	**Solar hot water heaters** 100% of new residential units 15% of existing residential units 100% of new commercial units 5% of existing commercial units	**Cost Type**	*Initial Capital Cost*	– Cost of installation and administration estimated at $2,500-$3,500 with a 30% federal rebate. The scenario shown is for a hypothetical solar hot water system (~65 square feet of roof space). – Financing shown in the calculation is for a home equity loan. Other financing programs such as power purchase agreements (PPAs) are available, the terms of which are specific to the solar financing company. The terms of the CaliforniaFIRST or HUD's PowerSaver program were not considered, though it is likely that the interest rates available through this program, if implemented, would be in the range of 7-8%.	California Solar Initiative www.gosolarcalifornia.ca.gov PG&E www.pge.com/tariffs/rateinfo.shtml Solar hot water calculator - *rael.berkeley.edu/berkeley/calculator#*
		Annual Cost	If financed through a home equity loan (~5% interest rate, 30 years): ~$640 average (years 1-10) and $1,100 (years 11-25) annual payment with an average of ~$180 (years 1-10) and $110 (years 11-25) annual savings Payback ~15 years assuming $890 average (years 1-10) and $1,440 (years 11-25) annual utility bill (pre-solar hot water system) with a 2.5% energy escalation factor		
		Total Cost	$3,000 ($2,100 with rebates)		
		Per Unit Cost	$3,000 per solar hot water unit		

ENERGY: Measure E-7					
Measure	**Mechanism**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
E-7: Increase On-site Renewable Energy Generation to Reduce Demand for Grid Energy	**Photovoltaic systems (Residential)** 100% of new residential units 5% of existing residential units	**Cost Type**	*Initial Capital Cost*	– Cost of solar PV system: $8/watt installed ($8,000/kW installed), though there is a downward trend in costs that can be expected to continue for at least the near-term future. Both federal and state tax credits are available, which total approximately 35%. The scenario shown is for a hypothetical 3-kW system (~300 square feet of roof space). – Financing shown in the calculation is for a home equity loan. Other financing programs such as power purchase agreements (PPAs) are available, the terms of which are specific to the solar financing company. The terms of the CaliforniaFIRST or HUD's PowerSaver were not considered, though it is likely that the interest rates available through this program, if implemented, would be in the range of 7-8%.	California Solar Initiative www.gosolarcalifornia.ca.gov PG&E www.pge.com/tariffs/rateinfo.shtml Solar calculator - *gosolarcalifornia.cleanpowerestimator.com*
		Annual Cost	**Residential** If financed through a home equity loan (~5% interest rate, 30 years): ~$80 monthly payment with an average of ~$70 savings (1st year) - cash positive in the first year Payback ~17-18 years assuming $100 average monthly utility bill (pre-PV system) with a 2.5% energy escalation factor		
		Total Cost	3-kW system: $24,000 total cost ($15,500 with rebates)		
		Per Unit Cost	$8,000 per kW installed		

ENERGY: Measure E-7					
Measure	**Performance Indicators**	**Categories**	**Economics Assumptions**	**Calculation and Assumptions**	**Sources**
E-7: Increase On-site Renewable Energy Generation to Reduce Demand for Grid Energy	**Photovoltaic systems (Commercial)** 100% of new commercial units 200,000 square feet of existing commercial rooftop space is used to install solar PV	**Cost Type**	*Initial Capital Cost*	– Cost of Solar PV system: $8/watt installed ($8,000/kW installed), though there is a downward trend in costs that can be expected to continue for at least the near-term future. Both federal and state tax credits are available, which total approximately 35%. The scenario shown is for a hypothetical 10-kW system (~1,000 square feet of roof space). – Financing shown in the calculation is for a commercial loan. Other financing programs such as power purchase agreements (PPAs) are available, the terms of which are specific to the solar financing company. The terms of the CaliforniaFIRST or HUD's PowerSaver , though it is likely that the interest rates available through this program, if implemented, would be in the range of 7-8%.	California Solar Initiative www.gosolarcalifornia.ca.gov PG&E www.pge.com/tariffs/rateinfo.shtml Solar calculator - *gosolarcalifornia.cleanpowerestimator.com*
		Annual Cost	**Commercial** If financed through a loan (~6% interest rate, 30 years): ~$310 monthly payment with an average of ~$380 savings (1st year) Payback ~11-12 years assuming $400 average monthly utility bill (pre-PV system) with a 2.5% energy escalation factor		
		Total Cost	10-kW system: $80,000 total cost ($51,500 with rebates)		
		Per Unit Cost	$8,000 per kW installed		

Appendix E

Supporting Measures

As shown in Table E-1, 19 measures have been identified as supporting measures. The county believes these measures are important to reduce greenhouse gas (GHG) emissions, but for which (a) there are no developed quantification methods or sufficient data available to support quantifying expected emission reductions; or (b) would not reduce emissions contained within the emissions inventory.

For example, there are no developed quantification methods and/or sufficient data for the following measures: *Reduce agricultural water consumption and irrigation-related energy-use*, *Reduce wastewater treatment emissions*, and *Reduce stormwater generation*.

There are relevant quantification methods for manure management associated with confined cattle operations, but not for horses, as in a measure to *Reduce livestock methane emissions*, and there are not current data available on existing consumer behavior (e.g., where they purchase goods or where those goods originate) as related to the measure to *Increase consumption of local agricultural products*.

Per discussions with the Yolo County Agriculture Commissioner, data on crop irrigation practices are highly variable by season (e.g., portions drawn from surface water versus groundwater) and, thus, the annual reduction potential would vary year-to-year.

Nonetheless, it is important to note that implementation of these supporting measures would result in GHG reductions within the unincorporated County even though the precise level cannot be quantified for the reasons outlined above. In general, GHG reduction potentials (MT CO_2e/year) are quantified by determining the scaled percent reduction. This first involves the identification of the percent reduction (e.g., as identified in the reduction mechanism or as substantiated in research and guidance documents), which is then applied to the size of the affected emissions inventory sector, and adjusted by the assumed participation rate. Though this type of specific information is not available for the supporting measures, their implementation could result in an aggregate GHG reduction (in 2030) generally ranging from 10-20%. It is important to note that this percent reduction range is not based on a quantitative analysis or in any way developed in a manner equivalent to the robust and substantiated process performed for the quantified primary measures. Rather, it is based on general estimates of percent reductions, the magnitude of affected emissions, and assumed participation rates. This general, aggregate estimate for the supporting measures was derived and extrapolated from information associated with those measures that are similar in nature and scope (e.g., applicable within the same sector), and are based on the consultant's experience in the field of climate action planning. Based on these assumptions, the general aggregate GHG reduction of 10-20% is provided for informational purposes only and should be further defined (and verified) in the monitoring stage of this plan.

Table E-1: Supporting Measures	
Sector	**Supporting Measures**
Agriculture	Increase use of biofuels or low-carbon fuels in field equipment
	Conservation Tillage
	Reduce methane emissions from manure management in horse facilities
	Increase consumption of local agricultural products
	Reduce agricultural water use through alternative irrigation techniques
	Expand surface irrigation infrastructure
	Expand use of bioengineered crops
Energy	Energy efficient appliances , lighting, and equipment in existing buildings
	Require energy efficient appliances, equipment, and lighting in new construction
	Pursue a district energy program in high density, mixed-use development
	Encourage industrial process energy efficiency
	Reduce embodied energy content of construction materials
	Promote greywater and rainwater collection and non-potable water systems
	Establish a standard of no net increase in water demand for new buildings
Solid Waste and Wastewater	Reduce waste emissions from organic materials
	Reduce disposal of non-organic materials through increased recycling
	Increase construction and demolition waste diversion standards
	Reduce wastewater treatment emissions
	Increase natural stormwater retention through implementing low impact development strategies
Total Estimated Aggregate GHG Reduction from Supporting Measures	10-20% (139,496-278,991 MT CO_2e/year in 2030)[1]

[1] It is important to note that this percent reduction range is not based on a quantitative analysis or in any way developed in a manner equivalent to the robust and substantiated process performed for the primary measures. Rather, it is based on general estimates of percent reductions, magnitude of affected emissions, and participation rates. This general, aggregate estimate for supporting measures was derived and extrapolated from information associated with primary measures that were similar in nature and scope (e.g., sector applicability) and based on the consultant's experience in the field of climate action planning. The general aggregate GHG reduction of 10-20% is provided for informational purposes only and is only a possible estimate that should be further defined (and verified) during the monitoring stage of this plan.

Appendix F

General Plan Policies and Actions

INTRODUCTION

Concepts of smart growth, and climate change conscious policies and actions, are prominent in the newly adopted Yolo County General Plan. The County's policy commitment to the goals of protecting agricultural land and directing the majority of future growth to existing cities discourages sprawl and encourages density, infill, compact community design, and development along transportation corridors. It also allows for local food production and recreational opportunities. Climate change policies and actions (more than 350 of them in total) appear in every element of the plan. In addition, the Conservation and Open Space Element contains individual sections addressing climate change and energy conservation.

The tables on the following pages identify General Plan policies and actions that each CAP measure is designed to implement.

CAP Measure Number	CAP Measure Title	General Plan Policies and Actions	General Plan Element	General Plan Policy Text
A-1	Reduce nitrogen fertilizer application rates	**Policy AG-2.6**	Agriculture and Economic Development	Work with appropriate local, State and federal agencies to conserve, study, and improve soils. Promote participation in programs that reduce soil erosion and increase soil productivity.
		Policy AG-5.8	Agriculture and Economic Development	Promote an ecologically sustainable food system.
		Policy CO-2.19	Conservation and Open Space	Support the use of sustainable farming methods that minimize the use of products such as pesticides, fuels and petroleum-based fertilizers.
		Policy CO-8.5	Conservation and Open Space	Promote GHG emission reductions by supporting carbon efficient farming methods (e.g. methane capture systems, no-till farming, crop rotation, cover cropping); installation of renewable energy technologies; protection of grasslands, open space, oak woodlands, riparian forest and farmlands from conversion to other uses; and development of energy-efficient structures.
A-2	Reduce fossil fuel consumption in field equipment	**Policy AG-2.14**	Agriculture and Economic Development	Recognize the valuable role that agriculture plays in mitigating the effects of climate change, including permanent crops that sequester carbon for long periods of time and the use of farming methods that reduce the use of fossil fuels and pesticides.
		Policy AG-5.8	Agriculture and Economic Development	Promote an ecologically sustainable food system.
		Policy CO-2.19	Conservation and Open Space	Support the use of sustainable farming methods that minimize the use of products such as pesticides, fuels and petroleum-based fertilizers.
		Policy CO-8.5	Conservation and Open Space	Promote GHG emission reductions by supporting carbon efficient farming methods (e.g. methane capture systems, no-till farming, crop rotation, cover cropping); installation of renewable energy technologies; protection of grasslands, open space, oak woodlands,

				riparian forest and farmlands from conversion to other uses; and development of energy-efficient structures.
A-3	Reduce energy use in agricultural irrigation pumping	**Policy AG-2.12**	Agriculture and Economic Development	Encourage farmers to employ agricultural practices that supplement rather than deplete topsoil and conserve or minimize water use.
		Policy CO-7.2	Conservation and Open Space	Support efforts to improve energy efficiency in existing irrigation systems.
A-4	Reduce confined livestock manure methane emissions	**Action AG-A9**	Agriculture and Economic Development	Work with the UC Cooperative Extension to develop technical assistance programs that may include: monitoring of changes in natural cycles; discouraging methane producing practices where feasible alternatives exist; encouraging methane recovery; and promoting farming practices that capture and store more carbon in the soil.
		Policy CO-8.5	Conservation and Open Space	Promote GHG emission reductions by supporting carbon efficient farming methods (e.g. methane capture systems, no-till farming, crop rotation, cover cropping); installation of renewable energy technologies; protection of grasslands, open space, oak woodlands, riparian forest and farmlands from conversion to other uses; and development of energy-efficient structures.
A-5	Reduce methyl bromide application	**Policy AG-2.14**	Agriculture and Economic Development	Recognize the valuable role that agriculture plays in mitigating the effects of climate change, including permanent crops that sequester carbon for long periods of time and the use of farming methods that reduce the use of fossil fuels and pesticides.
		Policy AG-5.8	Agriculture and Economic Development	Promote an ecologically sustainable food system.
		Policy CO-2.19	Conservation and Open Space	Support the use of sustainable farming methods that minimize the use of products such as pesticides, fuels and petroleum-based fertilizers.
		Policy CO-8.5	Conservation and Open Space	Promote GHG emission reductions by supporting carbon efficient farming methods (e.g. methane capture systems, no-till farming, crop rotation, cover cropping); installation of renewable energy technologies; protection of grasslands, open space, oak woodlands, riparian forest and farmlands from conversion to other uses; and

				development of energy-efficient structures.
A-6	Sequester carbon in agricultural landscapes	**Policy AG-2.13**	Agriculture and Economic Development	Promote wildlife-friendly farm practices, such as tailwater ponds, native species/grasslands restoration in field margins, hedgerows, ditch management for riparian habitat, restoration of riparian areas in manner consistent with ongoing water delivery systems, reduction of pesticides, incorporating winter stubble and summer fallow, etc.
		Policy AG-2.14	Agriculture and Economic Development	Recognize the valuable role that agriculture plays in mitigating the effects of climate change, including permanent crops that sequester carbon for long periods of time and the use of farming methods that reduce the use of fossil fuels and pesticides.
		Policy AG-5.8	Agriculture and Economic Development	Promote an ecologically sustainable food system.
		Action AG-A4	Agriculture and Economic Development	Consider development of a local and/or regional conservation bank to provide credits associated with crops and/or land uses that sequester carbon or greenhouse gas pollutants.
		Action AG-A9	Agriculture and Economic Development	Work with the UC Cooperative Extension to develop technical assistance programs that may include: monitoring of changes in natural cycles; discouraging methane producing practices where feasible alternatives exist; encouraging methane recovery; and promoting farming practices that capture and store more carbon in the soil.
		Policy CO-2.13	Conservation and Open Space	Promote the use of oak woodlands conservation banks to mitigate for losses due to development impacts and to provide carbon sequestration for greenhouse gas emissions under applicable State programs.
		Policy CO-2.19	Conservation and Open Space	Support the use of sustainable farming methods that minimize the use of products such as pesticides, fuels and petroleum-based fertilizers.
		Policy CO-2.23	Conservation and Open Space	Support efforts to coordinate the removal of non-native, invasive vegetation within watersheds and replacement with native plants.

		Action CO-A29	Conservation and Open Space	Adopt a heritage tree preservation ordinance.
		Action CO-A30	Conservation and Open Space	Develop a program to encourage landowners to restore degraded creek resources by: Removing exotic species and establishing native riparian vegetation.
		Policy CO-8.5	Conservation and Open Space	Promote GHG emission reductions by supporting carbon efficient farming methods (e.g. methane capture systems, no-till farming, crop rotation, cover cropping); installation of renewable energy technologies; protection of grasslands, open space, oak woodlands, riparian forest and farmlands from conversion to other uses; and development of energy-efficient structures.
		Action CO-A120	Conservation and Open Space	Adopt urban forestry practices that encourage forestation as a means of storing carbon dioxide, with the goal of doubling the tree canopy in unincorporated communities by 2030. Use appropriate protocols to assess owner eligibility to sell carbon credits.
Supporting Measure-Agriculture	Increase consumption of local agricultural products	**Policy AG-5.1**	Agriculture and Economic Development	Promote markets for locally and regionally grown and/or prepared food and other products and services.
		Policy AG-5.4	Agriculture and Economic Development	Encourage neighborhood grocery stores, farmers markets, community gardens and food assistance programs to increase their use of locally grown/prepared goods.
		Policy AG-5.6	Agriculture and Economic Development	Encourage institutions, such as schools, hospitals, colleges, government agencies, businesses and private food outlets such as grocery stores and restaurants, to provide foods produced locally and in the region.
		Policy AG-5.7	Agriculture and Economic Development	Provide opportunities within each unincorporated town for community gardens and farmers markets.
E-1	Pursue a community choice aggregation program	**Policy PF-10.1**	Public Facilities and Services	Pursuant to AB 117 (Statutes of 2002) explore “community choice aggregation” as a means of facilitating the purchase of electrical energy at the local level for community needs.
		Action PF-A63	Public Facilities and Services	Conduct a feasibility study regarding the applicability of “community choice aggregation” in Yolo County.

E-2	Reduce energy consumption in existing residential and non-residential buildings	**Policy CO-7.1**	Conservation and Open Space	Encourage conservation of natural gas, oil and electricity, and management of peak loads in existing land uses.
		Policy CO-7.4	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, where feasible.
		Policy CO-7.8	Conservation and Open Space	Increase energy efficiency and alternative energy utilization in existing buildings where feasible.
		Policy CO-7.10	Conservation and Open Space	Encourage residents to retrofit existing residences to maximize energy efficiency.
		Action CO-A111	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, in all new subdivisions.
		Policy CC-4.12.I	Community Character	Use of passive and active solar strategies and efficient heating and cooling technologies.
		Action PF-A66	Public Facilities and Services	Subsidize residential improvements for older homes that result in energy conservation.
E-3	Reduce energy consumption in new residential and non-residential buildings	**Policy CO-7.4**	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, where feasible.
		Action CO-A111	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, in all new subdivisions.
		Policy CC-4.12.I	Community Character	Use of passive and active solar strategies and efficient heating and cooling technologies.
E-4	Increase on-site renewable energy	**Policy CC-4.12.I**	Community Character	Use of passive and active solar strategies and efficient heating and cooling technologies.

	generation to reduce demand for grid energy	**Policy CC-4.4**	Community Character	Encourage all new construction to be zero-net energy by combining building energy efficiency design features with on-site clean distributed generation so as to result in no net purchases from the electricity or gas grid.
		Policy CC-4.5	Community Character	Encourage individual and community-based wind and solar energy systems (micro-grids).
		Action HO-A76	Housing	Promote the use of sustainable energy technologies (e.g. solar and wind) in new and rehabilitated housing when possible.
		Action PF-A68	Public Facilities and Services	Promote, and require where feasible, use of sustainable renewable energy sources to power homes, businesses, agriculture, and infrastructure.
		Policy PF-10.3	Public Facilities and Services	Provide financial and regulatory incentives for the installation of alternative energy and alternative energy conservation measures in all development approvals.
E-5	Promote on-farm renewable energy facilities (walnut hulls-to-energy)	**Policy CC-4.1.B**	Community Character	Encouraging projects to use regenerative energy heating and cooling source alternatives to fossil fuels.
		Policy CC-4.5	Community Character	Encourage individual and community-based wind and solar energy systems (micro-grids).
		Action PF-A68	Public Facilities and Services	Promote, and require where feasible, use of sustainable renewable energy sources to power homes, businesses, agriculture, and infrastructure.
		Policy ED-5.1	Economic Development	Assist businesses in reducing their dependence upon non-renewable resources, such as fossil fuels.
		Policy PF-10.3	Public Facilities and Services	Provide financial and regulatory incentives for the installation of alternative energy and alternative energy conservation measures in all development approvals.
E-6	Reduce water consumption in existing buildings and landscapes through	**Action CO-A84.1**	Conservation and Open Space	Consider adoption of an ordinance requiring existing homes to be retrofitted with water efficient appliances and fixtures prior to sale.

	increasing the efficiency of plumbing fixtures			
E-7	Promote weather-based irrigation systems and water efficient turf management	**Action CO-A83**	Conservation and Open Space	Adopt a Water Efficient Landscape Ordinance to require greater use of regionally native drought-tolerant vegetation, limitations on the amount of turf in residential development, computer controlled irrigation systems, and other measures as appropriate.
Supporting Measure-Energy	Promote energy efficient appliances, lighting, and equipment for existing buildings	**Policy CO-7.3**	Conservation and Open Space	Require all projects to incorporate energy-conserving design, construction, and operation techniques and features into all aspects of the project including buildings, roofs, pavement, and landscaping.
		Policy CO-7.4	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, where feasible.
		Policy CO-7.5	Conservation and Open Space	Require all new parking lots to significantly increase shading to relieve the potential for "heat islands."
		Policy CO-7.6	Conservation and Open Space	Encourage the use of building materials and methods that increase energy efficiency a minimum of 15%beyond State Title-24 standards for residential buildings and 20% beyond State Title 24 standards for commercial buildings.
		Policy CO-7.9	Conservation and Open Space	Require that new site and structure designs maximize energy efficiency.
		Policy CO-7.11	Conservation and Open Space	Strongly encourage LEED certification or equivalent for all public, private, and existing buildings and strongly encourage LEED-Neighborhood Design (ND) certification or equivalent for other applicable projects, particularly within the Specific Plan areas.
		Action CO-A111	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, in all new subdivisions.
		Action CO-A113	Conservation and Open Space	Amend the Zoning Code to include regulations for all new parking lots to include tree plantings that will result in 50% shading of parking lot surface areas within 10 years.

		Action CO-A114	Conservation and Open Space	Use Development Agreements and/or adopt an ordinance to require the use of building materials and methods that increase energy efficiency a minimum of 15% beyond State Title-24 standards for residential construction and 20% beyond Title 24 for commercial construction, where feasible.
		Action CO-A119	Conservation and Open Space	Require the implementation of cost-effective and innovative emission reduction technologies in building components and design.
		Policy CC-4.1A	Community Character	Requiring projects to take advantage of shade, prevailing winds, landscaping and sun screens to reduce energy use.
		Policy CC-4.4	Community Character	Encourage all new construction to be zero-net energy by combining building energy efficiency design features with on-site clean distributed generation so as to result in no net purchases from the electricity or gas grid.
		Policy CC-4.6	Community Character	Encourage all new residences to exceed Title 24 energy standards by at least 15%, and encourage all new commercial buildings to exceed Title 24 by at least 20%.
		Policy CC-4.7	Community Character	Require energy efficient design for all buildings.
		Policy CC-4.8	Community Character	Require measures to minimize “heat islands” by requiring light-colored and reflective roofing materials and paint; light colored roads and parking lots; extensive numbers of shade trees in parking lots; and shade trees and/or overhangs on the south and west sides of new or renovated buildings.
		Policy CC-4.12.I	Community Character	Use of passive and active solar strategies and efficient heating and cooling technologies.
		Policy CI-5.10	Circulation	Institute requirements for the establishment and maintenance of extensive tree canopy over community roadways to create shade.
		Action HO-A78	Housing	Develop site design guidelines for energy conserving development.

Supporting Measure-Energy	Include passive design requirements in development standards	**Policy CO-7.3**	Conservation and Open Space	Require all projects to incorporate energy-conserving design and construction techniques and features.
		Policy CO-7.4	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, where feasible.
		Policy CO-7.5	Conservation and Open Space	Require all new parking lots to significantly increase shading to relieve the potential for "heat islands."
		Policy CO-7.6	Conservation and Open Space	Encourage the use of building materials and methods that increase energy efficiency a minimum of 15% beyond State Title-24 standards for residential buildings and 20% beyond State Title 24 standards for commercial buildings.
		Policy CO-7.9	Conservation and Open Space	Require that new site and structure designs maximize energy efficiency.
		Policy CO-7.11	Conservation and Open Space	Strongly encourage LEED certification or equivalent for all public, private, and existing buildings and strongly encourage LEED-Neighborhood Design (ND) certification or equivalent for other applicable projects, particularly within the Specific Plan areas.
		Action CO-A111	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, in all new subdivisions.
		Action CO-A113	Conservation and Open Space	Amend the Zoning Code to include regulations for all new parking lots to include tree plantings that will result in 50% shading of parking lot surface areas within 10 years.
		Action CO-A114	Conservation and Open Space	Use Development Agreements and/or adopt an ordinance to require the use of building materials and methods that increase energy efficiency a minimum of 15% beyond State Title-24 standards for residential construction and 20% beyond Title 24 for commercial construction, where feasible.
		Action CO-A119	Conservation and Open Space	Require the implementation of cost-effective and innovative emission reduction technologies in building components and design.

		Policy CC-4.1.A	Community Character	Requiring projects to take advantage of shade, prevailing winds, landscaping and sun screens to reduce energy use.
		Policy CC-4.4	Community Character	Encourage all new construction to be zero-net energy by combining building energy efficiency design features with on-site clean distributed generation so as to result in no net purchases from the electricity or gas grid.
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		Policy CC-4.12.I	Community Character	Use of passive and active solar strategies and efficient heating and cooling technologies.
		Policy CI-5.10	Circulation	Institute requirements for the establishment and maintenance of extensive tree canopy over community roadways to create shade.
		Action HO-A78	Housing	Develop site design guidelines for energy conserving development.
Supporting Measure-Energy	Require energy efficient appliances, equipment, and lighting in new construction	**Policy CO-7.4**	Conservation and Open Space	Require the use of Energy Star certified appliances, such as water heaters, swimming pool heaters, cooking equipment, refrigerators, furnaces and boiler units, where feasible.
Supporting Measure-	Promote non-potable water systems such as	**Action CO-A89**	Conservation and Open Space	Encourage roof catchment and the use of rainwater for non-potable uses to reduce the need for groundwater.

Energy	greywater and rainwater collection systems	**Policy ED-5.10**	Economic Development	Require the re-use of processed water for landscaping and other appropriate activities, where feasible.
		Policy CO-5.15	Conservation and Open Space	Encourage new development and redevelopment to use reclaimed wastewater, where feasible, to augment water supplies and to conserve potable water for domestic purposes.
Supporting Measure-Energy	Establish a standard of no net increase in water demand for new buildings	**Policy CO-5.19**	Conservation and Open Space	Strive for "water-neutral" development with new water demand offset by efficiency improvements elsewhere in the system. Require all new developments to offset new water demands to the greatest extent feasible.
WR-1	Reduce landfill methane emissions through capture systems	**Policy PF-9.5**	Public Facilities and Services	Promote technologies, including biomass or biofuels, which allow the use of solid waste as an alternative energy source.
		Policy PF-9.11	Public Facilities and Services	Expand opportunities for energy and/or fuel production resulting from the solid waste disposal process.
		Action PF-A57	Public Facilities and Services	Reduce methane emissions from the landfill by closing the filled units, expanding bioreactor operations and the landfill gas collection system to future landfill units; and continuing the use of the landfill gas for energy or fuel.
Supporting Measure-Waste	Reduce waste emissions from organic materials	**Policy PF-9.8**	Public Facilities and Services	Require salvage, reuse or recycling of construction and demolition materials and debris at all construction sites.
		Policy ED-5.2	Economic Development	Work with businesses to reduce the quantity and improve the quality of their waste stream and to ensure that waste is disposed of properly.
		Policy ED-5.9	Economic Development	Support reductions in the use of hazardous materials and require businesses to employ proper disposal and recycling mechanisms.
Supporting Measure-Waste	Reduce disposal of non-organic materials through increased recycling	**Action PF-A49**	Public Facilities and Services	Develop new and/or expand current diversion and recycling programs for residential, commercial, office, educational, agricultural, and recreational uses.

Supporting Measure-Waste	Increase construction and demolition waste diversion standards	**Policy CC-4.12.G**	Community Character	Require "green" design, construction and operation including: G. Recycling of construction and demolition waste.
AD-1	Develop governance strategies to ensure that Yolo County remains resilient to climate change	**Policy CO-8.3**	Conservation and Open Space	Prepare appropriate strategies to adapt to climate change based on sound scientific understanding of the potential impacts.
		Action CO-124	Conservation and Open Space	In conjunction with, or immediately following, preparation of the Greenhouse Gas Emissions Reduction/Climate Action Plan(s) for the County, require countywide departmental analysis of how predicted effects of climate change will affect responsibilities and resources of each department. Develop strategies and actions to addresses outcomes.
AD-2	Anticipate climate adaptation within Yolo County agriculture	**Policy AG-2.7**	Agriculture and Economic Development	Encourage farmers and agricultural businesses to prepare for opportunities and adversities that may result from climate change.
AD-3	Anticipate climate change effects on water resources	**Policy CO-5.10**	Conservation and Open Space	Encourage water purveyors to develop plans for responding to droughts and the effects of global climate change, including contingency plans, the sharing of water resources to improve overall water supply reliability, and the allocation of water supply to priority users.
		Action CO-A74	Conservation and Open Space	Work with water purveyors in the County to plan for possible changes to water supply and quality resulting from global warming.
		Action HS-A59	Health and Safety	Study the implications of climate change for future emergencies, including the increased risk and severity of fires; increased frequency and intensity of drought; expanded and deeper areas of flooding; and associated changes in disease vectors.
AD-4	Respond to the potential threat of sea level rise	**Action HS-A5**	Health and Safety	Require a minimum of 100-year flood protection for new construction, and strive to achieve 200-year flood protection for unincorporated communities. Where such levels of protection are not provided, require new development to adhere to the requirements of State law and the County Flood Damage Prevention Ordinance.
		Action HS-A18	Health and Safety	Coordinate with local, State and Federal agencies to define existing and potential flood problem areas, including the possible impacts associated with global climate change, and to maintain and improve levees and other flood control features.

		Action HS-A26	Health and Safety	Review on an annual basis those portions of the unincorporated area that are subject to flooding, based on mapping prepared by the Federal Emergency Management Agency and/or the Department of Water Resources, and amend the General Plan as appropriate to reflect any changes.
		Action HS-A27	Health and Safety	Revise the Health and Safety Element, concurrently with the regular update to the Housing Element, to include new information regarding floodplain mapping and/or regulation.
		Action HS-A29	Health and Safety	Pursuant to Section 8201 of the State Water Code, develop local plans for flood protection, including analysis of financing options to construct and maintain any needed improvements, to address how 100-year floodplain protection for each community may be provided. Those communities that are economically disadvantaged and at greatest risk shall have priority in developing flood protection plans. The cities shall be consulted in development of the plans, which shall be consistent with the Central Valley Flood Protection Plan.
		Action HS-A59	Health and Safety	Study the implications of climate change for future emergencies, including the increased risk and severity of fires; increased frequency and intensity of drought; expanded and deeper areas of flooding; and associated changes in disease vectors.
AD-5	Protect the public from increased health risks	**Policy PF-5.8**	Public Facilities and Services	Anticipate and adapt to potential changes in frequency and severity of wildfires resulting from predicted effects of global warming.
		Action PF-A28	Public Facilities and Services	Amend the County Code to incorporate measures such as fire-safe building materials, clear spaces and fuel reduction, fire breaks, and fire suppression systems for all new development located in high fire hazard areas.
		Action HS-A5	Health and Safety	Require a minimum of 100-year flood protection for new construction, and strive to achieve 200-year flood protection for unincorporated communities. Where such levels of protection are not provided, require new development to adhere to the requirements of State law and the County Flood Damage Prevention Ordinance.
		Action HS-A18	Health and Safety	Coordinate with local, State and Federal agencies to define existing and potential flood problem areas, including the possible impacts associated with global climate change, and to maintain and improve levees and other flood control features.

		Action HS-A26	Health and Safety	Review on an annual basis those portions of the unincorporated area that are subject to flooding, based on mapping prepared by the Federal Emergency Management Agency and/or the Department of Water Resources, and amend the General Plan as appropriate to reflect any changes.
		Action HS-A27	Health and Safety	Revise the Health and Safety Element, concurrently with the regular update to the Housing Element, to include new information regarding floodplain mapping and/or regulation.
		Action HS-A38	Health and Safety	Require new and/or existing development to establish “defensible space” by providing for clearance around structures, using fire-resistant ground cover, building with fire-resistant roofing materials, fuel load reduction, and taking other appropriate measures.
		Action HS-A40	Health and Safety	Require land divisions within the very high and high risk Fire Hazard Severity Zones to demonstrate the following: guaranteed availability of adequate water; provision of more than one access point for firefighting equipment; permanent maintenance of defensible space around all buildings; and use of fire-resistant materials in construction.
		Action HS-A41	Health and Safety	Cluster residential units located in areas of high fire risk with adequate access to maintained emergency evacuation routes to ensure adequate access for firefighting equipment and escape routes for residents in rural areas.
		Action HS-A59	Health and Safety	Study the implications of climate change for future emergencies, including the increased risk and severity of fires; increased frequency and intensity of drought; expanded and deeper areas of flooding; and associated changes in disease vectors.

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Appendix G

Glossary of Acronyms

This glossary defines acronyms used in the Climate Action Plan.

AB: Assembly Bill

ARB: Air Resources Board

ARRA: American Recovery and Reinvestment Act

BCS: Biogas Control System

BFE: Base Flood Elevation

C&D: Construction and Demolition

CAFÉ: Corporate Average Fuel Economy

CAO: County Administrator's Office

CAP: Climate Action Plan

CAT: Climate Action Team

CBECS: Commercial Building Energy Consumption Survey

CCA: Community Choice Aggregation

CCAR: California Climate Action Registry

CCCC: California Climate Change Center

CDFA: Department of Food and Agriculture

CEC: California Energy Commission

CEQA: California Environmental Quality Act

CFL: Compact Fluorescent Light

CGBC: California Green Building Code

CH_4: Methane

CHP: Combined Heat and Power

CIEDB: California Infrastructure and Economic Development Bank

CO_2: Carbon Dioxide

CO_2e: Carbon Dioxide Equivalent

COLE: Carbon Online Estimator

CPUC: California Public Utilities Commission

CRS: Community Rating System

CSI: California Solar Initiative

CVFPB: Central Valley Flood Protection Board

CVRWQCB: Central Valley Regional Water Quality Control Board

DFG: Department of Fish and Game

DOC: Department of Conservation

DOE: Department of Energy

DOF: Department of Finance

DSP: Dunnigan Specific Plan

DWR: Department of Water Resources

EAI: Enhanced Automation Initiative

EIR: Environmental Impact Report

EMFAC: On-Road Mobile Source Emission Factor Model

EPA: Environmental Protection Agency

EPBB: Expected Performance Based Buydown

ESCO: Energy Savings Company

ESPC: Energy Savings Performance Contract

ET: Evapotranspiration

F: Farenheit

FEMA: Federal Emergency Management Agency

FHA: Federal Housing Administration

GHG: Greenhouse Gas

GIS: Geographic Information System

GP: General Plan

GPM: Gallons per Minute

GWP: Global Warming Potential

HCD: Housing and Community Development

HH: Household

HPMS: Highway Performance Monitoring System

HUD: Housing and Urban Development

HVAC: Heating, Ventilating, and Air Conditioning

ICLEI: International Council for Local Environmental Initiatives

IPCC: Intergovernmental Panel on Climate Change

IRWMP: Integrated Regional Water Management Plan

ISRFP: Infrastructure State Revolving Fund Program

IWM: Integrated Waste Management

KW: Kilowatt

KWH/M^2: Kilowatt Hour per Square Meter

LCFS: Low Carbon Fuel Standard

LED: Light Emitting Diode

LEED: Leadership in Energy and Environmental Design

LFG: Landfill Gas

LID: Low Impact Development

LIHEAP: Low-Income Home Energy Assistance Program

MPO: Metropolitan Planning Organization

MT: Metric Tons

MTC: Metric Tons of Carbon

MW: Megawatt

N_2: Nitrogen

NA: Not Applicable

NFIP: National Flood Insurance Program

NMOC: Non-Methane Organic Compound

N_2O: Nitrous Oxide

NRA: Natural Resources Agency

NREL: National Renewable Energy Laboratory

NRCS: Natural Resource Conservation Service

O_2: Oxygen

OAMHMP: Operational Area Multi-Hazard Mitigation Plan

OES: Office of Emergency Services

OFFROAD: Off-Road Mobil-Source Emission Factor Model

OPE: Overall Plant Efficiency

PACE: Property Assessed Clean Energy

PBI: Performance Based Incentive

PCIP: Pacific Council on International Policy

PG&E: Pacific Gas and Electric Company

PPA: Power Purchase Agreement

PPM: Parts Per Million

PPW: Planning and Public Works

PSI: Pounds per Square Inch

PV: Photovoltaic

QECB: Qualified Energy Conservation Bond

RCD: Resource Conservation District

RECS: Residential Energy Consumption Survey

RPS: Renewable Portfolio Standard

RTAC: Regional Target Advisory Committee

SACOG: Sacramento Area Council of Governments

SB: Senate Bill

SEMS: Standardized Emergency Management System

SEP: State Energy Program

SGIP: Self-Generation Incentive Program

SRTS: Safe Routes to Schools

SSIM: Sustainable Systems Integration Model

SSLV: Steady State Live Weight

SWH: Solar Water Heating

TDF: Travel Demand Forecasting

UCD: University of California at Davis

URBEMIS: Urban Emissions Model

USGBC: United States Green Building Council

VMT: Vehicle Miles Traveled

WAP: Weatherization Assistance Program

WBIC: Weather Based Irrigation Controller

WRA: Water Resources Association

YCCL: Yolo County Central Landfill

YCFCWCD: Yolo County Flood Control and Water Conservation District

YSAQMD: Yolo-Solano Air Quality Management District