2 GREENHOUSE GAS EMISSIONS AND REDUCTION TARGETS

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.

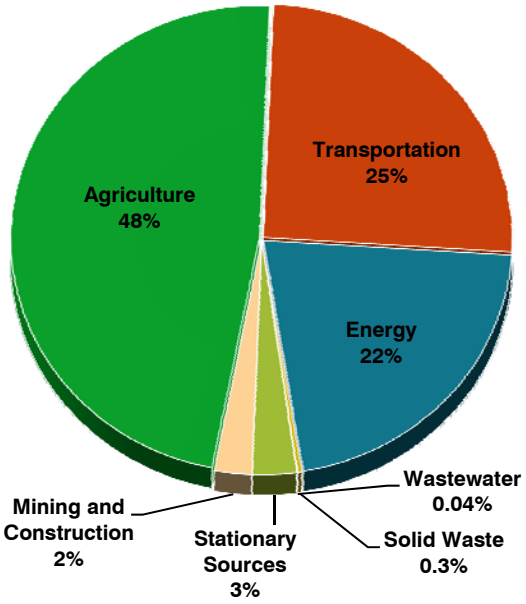
This chapter describes communitywide GHG emissions inventories for unincorporated Yolo County in 1990 and 2008. Emission projections for 2020, 2030, 2040, and 2050 are provided, as well as emission reduction targets and goals for each year. The role of anticipated State and federal actions is included 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



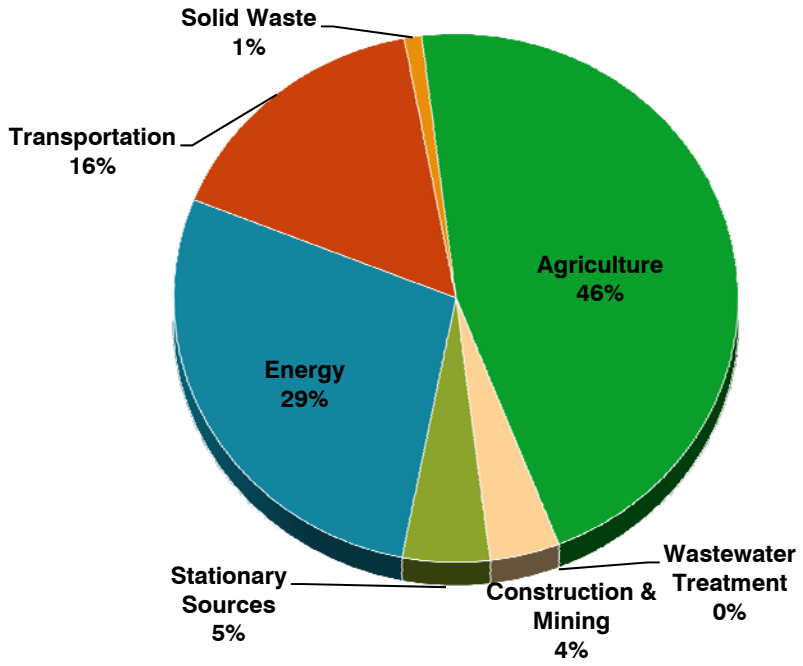
- **Energy Consumption** – Emissions from electricity production, natural gas and propane combustion, and domestic water consumption.
- **Transportation** – Emissions from vehicles traveling on highways and roadways within the County, adjusted to deduct trips that did not start and/or finish in the County (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

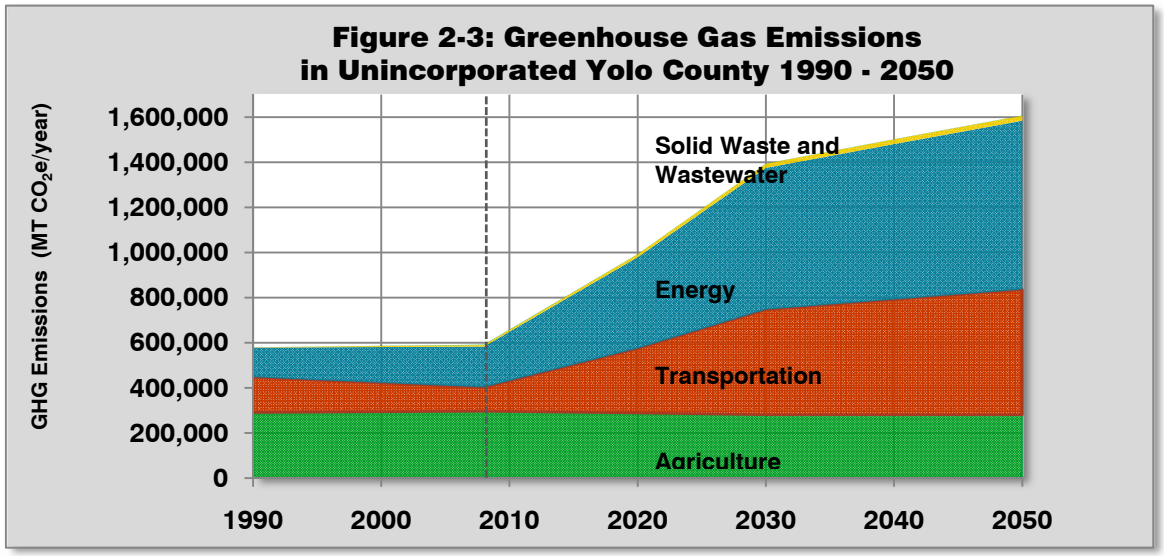


2008 Emission Inventory

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

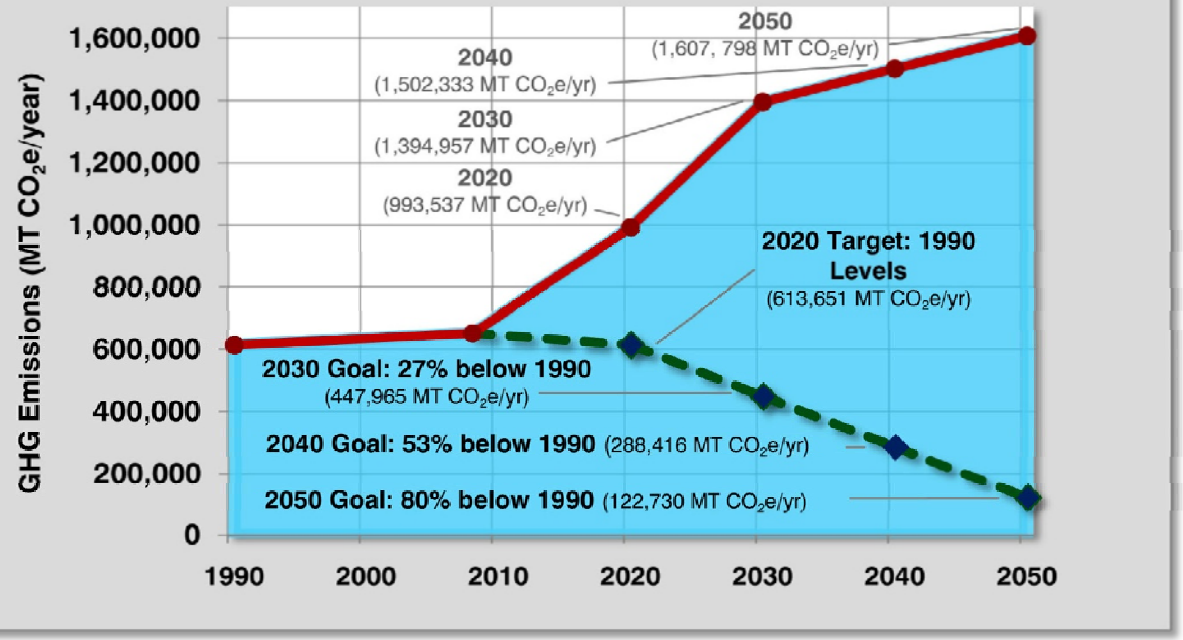
Sector	1990	2008		2020		2030		2040		2050	
	MT CO_2e/yr	MT CO_2e/yr	Change from 1990	MT CO_2e/yr	Change from 1990	MT CO_2e/yr	Change from 1990	MT CO_2e/yr	Change from 1990	MT CO_2e/yr	Change from 1990
Agriculture	292,032	297,341	1.8%	289,482	-0.9%	281,624	-4%	281,624	-4%	281,624	-4%
Transportation	155,577	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.