UNINCORPORATED MONTEREY COUNTY GREENHOUSE GAS INVENTORY

2018 Base Year

An EcoDataLab Report
Prepared for Land Watch
Monterey County

April 26, 2021

EcoDataLab

Summary

Monterey County's overall greenhouse gas inventory is overwhelmingly dominated by agricultural and transportation emissions. EcoDataLab's inventory estimates that roughly 45% of GHG emissions from the unincorporated area of the County derive from agriculture, with another 31% coming from transportation (both on- and off-road). Industrial emissions and natural gas usage remain substantial throughout the County, though the transition to Central Coast Community Energy and their 100% carbon-free electricity portfolio has virtually eliminated electricity emissions.

Because roughly 76% of Monterey County's emissions come from agriculture and transportation, the County's mitigation strategies need to focus on these two sectors.

Greenhouse Gas Inventory

Figure 1. below presents an estimated greenhouse gas (GHG) emissions inventory for Monterey County. Fig. 2 presents the same inventory on a percentage basis.

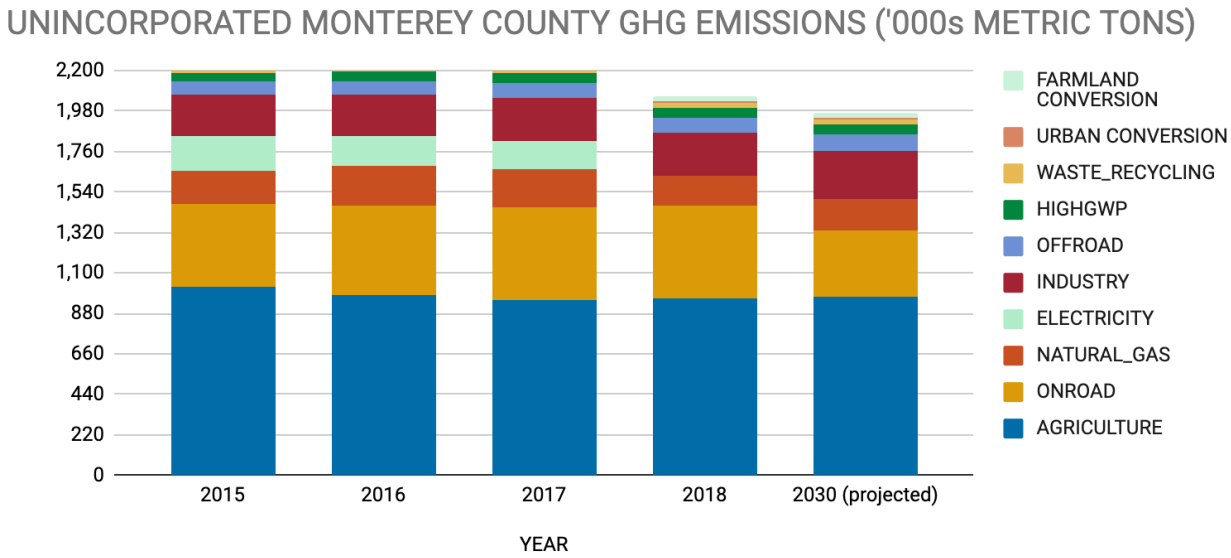

Figure 1. Unincorporated Monterey County GHG emissions, 2015-2018 and 2030 projection (1,000s of metric tons)

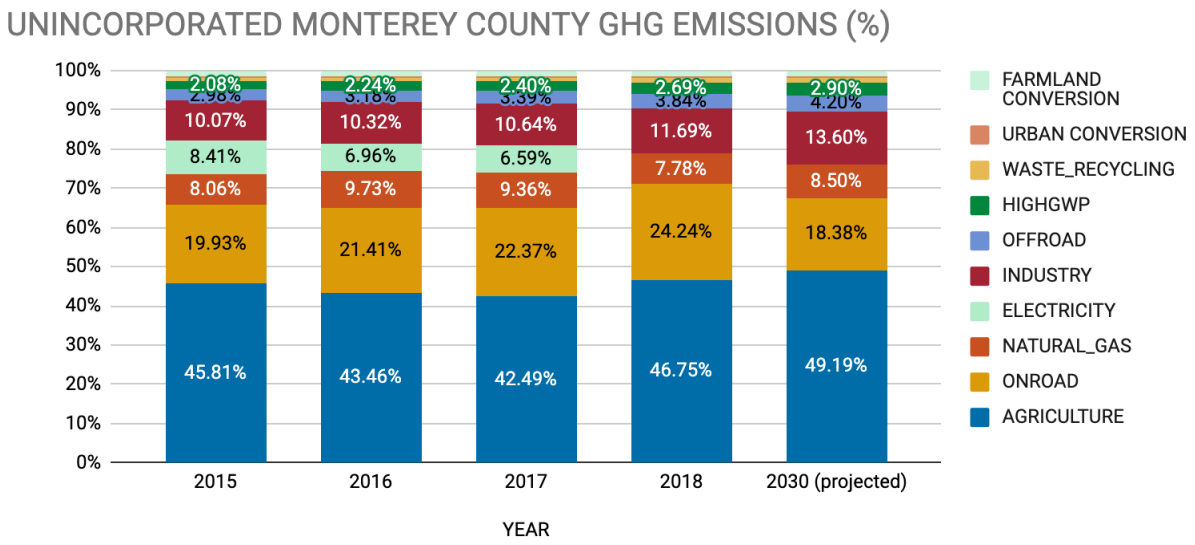

Figure 2. Unincorporated Monterey County GHG emissions, 2015-2018 and 2030 projection, % of total emissions

Methodology

Agriculture: The average statewide GHG emissions per dollar of non-rice crop and livestock production was separately calculated, and applied to the total agricultural output of Monterey County in these respective categories. All crops and livestock are assumed to be located in the unincorporated area of the County.

Transportation: Origin-destination modeled results were requested from AMBAG but were unavailable. Instead, this methodology uses CARB's EMFAC modeled countywide VMT and emissions by vehicle type, combined with CARB's Fleet Database for vehicle type registrations by census block group. Emissions by vehicle type are split out by their respective block groups, aggregated up in cities, and subtracted from the total to get the overall estimate for the unincorporated area of the County. Off-road emissions are based upon population-weighted county averages from CARB's OFFROAD2017 model.

Electricity & Natural Gas: Estimates of electricity and natural gas usage were derived from California Energy Commission data on countywide energy consumption and scaled by the share of the total County population living in unincorporated areas.

Industry: Industrial emissions were derived from the statewide average based upon service population (employment + population), which compared closely with the estimates from the 2010 General Plan EIR.

Waste & Recycling: Waste and recycling estimates were derived from the California GHG inventory and allocated per capita.

High GWP gases (e.g., refrigerants): The emissions from gases with high global warming potential (GWP) is based upon the statewide average emissions per employee and scaled to the number of employees at businesses registered in the unincorporated area of the County. These gases as reported by CARB are typically refrigerants.

Land use changes: Every 1% change in soil organic matter (SOM) translates to roughly 5 tons of carbon[1], which would produce 19 tons of CO_2 if released. Farmland is typically around 3-6% organic material[2], while the USDA[3] estimates that oak woodlands typically have around 40 tons of carbon stored in the soil per acre, which comes out to 8% SOM. The 2010 General Plan anticipated converting 2,571 acres of farmland to urban area through 2030, or roughly 111 acres per year, and an additional 10,253 acres of uncultivated land to be converted to cropland from 2008 to 2030, based on an historic conversion rate of 466 acres per year. This methodology used 4.5% SOM for croplands and the General Plan conversion rates.

Business-as-usual Projections to 2030

The 2030 projection was developed based upon a combination of statewide and national trends, and local AMBAG projections.

Agriculture, industrial, and high GWP emissions are scaled with employment growth projections from AMBAG. Natural gas, offroad, and waste emissions are scaled using countywide population growth projections from CA Department of Finance, scaled based upon AMBAG's share of RHNA allocations to the unincorporated area of the County. (The RHNA allocations attributed a greater share of the countywide growth than AMBAG's own population growth estimates).

Electricity is assumed to continue to be 100% carbon-free. VMT is assumed to increase at a constant per capita basis, but under current CAFE standards, fuel economy is projected to improve by roughly 3% per year. Land use change is assumed to remain constant.

[1] https://extension.psu.edu/can-i-increase-soil-organic-matter-by-1-this-year
[2] http://franklin.cce.cornell.edu/resources/soil-organic-matter-fact-sheet
[3] https://www.fs.usda.gov/ccrc/topics/forest-soil-carbon

Methodology Limitations

This inventory methodology was selected to provide quick, rough estimates to focus and inform preliminary identification of mitigation strategies. This analysis was limited due to time and budget constraints. Monterey County should seek to use better methodologies in several areas.

The discussion below identifies limitations and uncertainties in this inventory. The next section recommends best practices for Monterey County's upcoming greenhouse gas inventory.

Agriculture: This methodology assumed all agriculture takes place in the unincorporated area of the County, and that the County's non-rice crop emissions profile is comparable to the state as a whole, on a per dollar basis. Monterey County has roughly 8% of the state's total crop output by value, but only 5% of the state's total crop acreage and under 4% of the state's total crop tonnage. Monterey County is also a disproportionately large producer of certain crops, such as lettuce and strawberries. We expect this value to be *somewhat overestimated*.

Transportation: A more accurate GHG inventory should use an origin-destination modeling approach, but data were not available from AMBAG in time for the preparation of this analysis. Instead, using CARB's EMFAC model and Fleet Database, emissions from all vehicles registered in the unincorporated area of the County are fully assigned to the County (both resident and business vehicles). However, no emissions from other vehicles are included (e.g., in-commuters). In contrast, an origin-destination model would allocate emissions from *all* trips to or from the unincorporated area of the County, split between the origin and destination.

The unincorporated area of the County has a higher ratio of jobs to residents than the County as a whole (0.54 jobs per person versus 0.48 countywide). While the lack of an origin-destination model makes it difficult to confirm, there is likely a net in-flow of commuters to the unincorporated area of the County from major residential hubs like Salinas and Soledad. With many agricultural businesses headquartered in cities, additional business vehicles for shipping and transportation may be registered there and also excluded from this analysis. Lastly, this methodology doesn't capture any tourism trips to destinations in the unincorporated area of the County. In comparison to a preferred origin-destination approach, we expect this value to be *moderately underestimated*.

Electricity & Natural Gas: This methodology assumes that per capita energy consumption in the unincorporated area of the County is equivalent to the countywide average. This neglects any other energy sources used for homes not connected to the gas or electricity grid, as well as the possibility that natural-gas-heavy industries are disproportionately located in the unincorporated areas of the County. In addition, this methodology assumes 100% of customers in the unincorporated area of the County are on C3Energy's 100% carbon-free electricity plan by 2018. Overall, we expect this value to be *slightly underestimated*.

Industrial Emissions: While this estimation methodology comes close to the values from the 2010 General Plan EIR, neither this analysis nor the 2010 General Plan actually looked at what industrial processes are occurring within the unincorporated county (the General Plan EIR approach was a zip-code level analysis; most zip codes in the county overlap both unincorporated and incorporated areas). Statewide, most industrial process emissions derive from oil refineries and cement plants (natural gas use from industrial activity is already included in natural gas above). Based on a preliminary review of industrial activities and locations in the county, most identified cement plants were in cities, and no oil refineries were noted, and so we expect this value to be *somewhat overestimated*.

Waste & Recycling: Waste & recycling per capita emissions does not generally vary significantly across the state. While several landfills are geographically located in the unincorporated county, the 2010 General Plan EIR attributed GHG emissions from waste based upon the waste generated within the unincorporated area of the County. As a result, we expect this value to be *roughly accurate*.

High GWP gases (refrigerants): Data on high GWP sources are not readily available at sufficient granularity at the local level. However, the use of high GWP refrigerants is growing faster than employment, as older ozone-depleting gases are replaced. In addition, refrigerant use in the County is likely higher than the statewide average, due to the significant agricultural activity. We expect this value to be *somewhat underestimated*.

Land Use Change: Actual direct data on SOM and land use change was unavailable. Overall, we expect this value to be *roughly accurate*.

Recommendations for Future Inventories

This rough inventory has important data gaps and methodological shortcomings, as discussed above. To improve upon our approach, the County's Climate Action Plan should address the following:

1. Agriculture: A bottoms-up analysis of agricultural emissions is critical given the scale of agricultural activity in the County. Analysis of specific agricultural emissions is also necessary to identify mitigation opportunities and assess their efficacy. The County should use direct data on fertilizer application or, failing that, identify appropriate emission factors to use for each crop type grown in the County. The County should also quantify use of GHG fumigants (e.g., methyl bromide). In addition, the climate action plan should identify the range of variability in agricultural emissions, best practices for emission reductions from both crop and livestock, and whether these practices are already in place across the County.
2. Transportation: An origin-destination model approach, such as the one used by AMBAG for the regional travel demand model, is critical for understanding the VMT that is attributable to jobs, housing, and tourism destinations in the unincorporated area of the County. Estimating VMT based upon local road activity and a population-weighted share of highway VMT, as was done previously, would be insufficient. The unincorporated area of the County has a disproportionately high number of jobs relative to the County as a whole, and trips to or from the unincorporated area may be a disproportionate share of total highway VMT due to the significant distances involved in traversing the County.
3. High GWP gases (refrigerants): The County should either obtain direct data on refrigerant usage or develop better sector-weighted estimates that reflect the County's unique situation, i.e., the high levels of refrigerant use in agriculture. This bottoms-up data is necessary to identify mitigation and to assess its efficacy.
4. Industrial emissions: The County should do a site-by-site analysis of industrial sources to determine which ones are in fact located in the unincorporated area of the County, and estimate their process emissions accordingly.

Contact Information
Ben Gould, President, EcoDataLab
ben@ecodatalab.com