

The Economic, Health, and Environmental Benefits of Phasing Out Onshore Oil Development in Santa Barbara County

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1 Introduction

In September 2024, Governor Newsom signed AB 3233, the “Local Environmental Choice and Safety Act,” which took effect January 1, 2025. This law empowers cities and counties to exert greater control over oil and gas operations in their community. Specifically, the law allows cities and counties to, through an ordinance, regulate, limit, or prohibit proposed and existing oil and gas operations within their jurisdictions. AB 3233 clarified local government authority in response to recent court decisions finding that state agencies’ responsibility for regulating oil and gas development preempted local regulatory control.

State Senator Monique Limón and Assemblymember Gregg Hart, both representing Santa Barbara County, supported AB 3233. The County itself voiced strong support for AB 3233, emphasizing the importance of environmental protection, public health, and local control in a letter to the state legislature.¹

Should the Santa Barbara County Board of Supervisors choose to act on this new authority and phase out oil and gas operations – for example, in an action related to the County’s Climate Action Plan or as a standalone ordinance – such a regulation would directly support the state goal to phase out oil production no later than 2045.

Additionally, acting on this new authority to regulate County oil production would bring local policy into alignment with local public opinion. Residents of Santa Barbara County hold strong beliefs about oil and gas development and climate action. Approximately 60% of county residents believe their local officials should do more to address global warming;² 56% oppose expanding offshore drilling for oil and natural gas, and 69% believe developing clean energy should be a priority. Each of these is greater than the state average, indicating a local desire to phase out fossil fuels and align local energy policymaking with wider climate mitigation goals.

This report evaluates the likely economic, health, and environmental impacts of an oil phaseout in the County wherein no new drilling is permitted and existing oil wells are plugged and remediated as soon as possible.

Summary Findings

- ***Phasing out oil and gas operations in Santa Barbara County would significantly improve public health*** by reducing exposure to harmful pollutants such as PM_{2.5} and volatile organic compounds (VOCs). A phaseout policy could prevent an estimated \$54 to \$81 million in mortality-related costs by 2045.
- ***The economic impact of an oil phaseout would be limited, with minimal job losses and fiscal effects.*** Industry job losses could be offset by employment in asset decommissioning and in growing clean energy sectors. Oil property taxes contribute just \$3.3 million or ~0.2% of county revenues.
- ***Reducing oil production would help Santa Barbara County meet climate goals and avoid millions in climate-related damages.*** A phaseout policy could prevent the release of 344,072 metric tons of CO₂e by 2045, with avoided climate damages valued at \$21.8 million.

2 Impacts of Phasing Out Onshore Oil

In Santa Barbara County there are 13 active onshore oil and gas fields and 1,038 active oil and gas wells.³ These production wells have health, economic, and climate impacts on the County.

2.1 Health Impacts

Oil production endangers public health

Oil and gas operations produce particulate matter ($PM_{2.5}$), a dangerous air pollutant that can enter people's lungs and even bloodstream. Figure 1 shows the $PM_{2.5}$ concentration of all oil-field emissions in Santa Barbara County. Exposure to $PM_{2.5}$ has been linked to increased risk of heart disease, aggravated asthma, diabetes, and premature death.⁴ Oil extraction also generates volatile organic compounds (VOCs) which can cause difficulty breathing, damage the central nervous system, and increase cancer risk.⁵ In Santa Barbara County, 40% of oil and gas wells are within 1 mile of sensitive areas such as schools, hospitals, and residential areas.

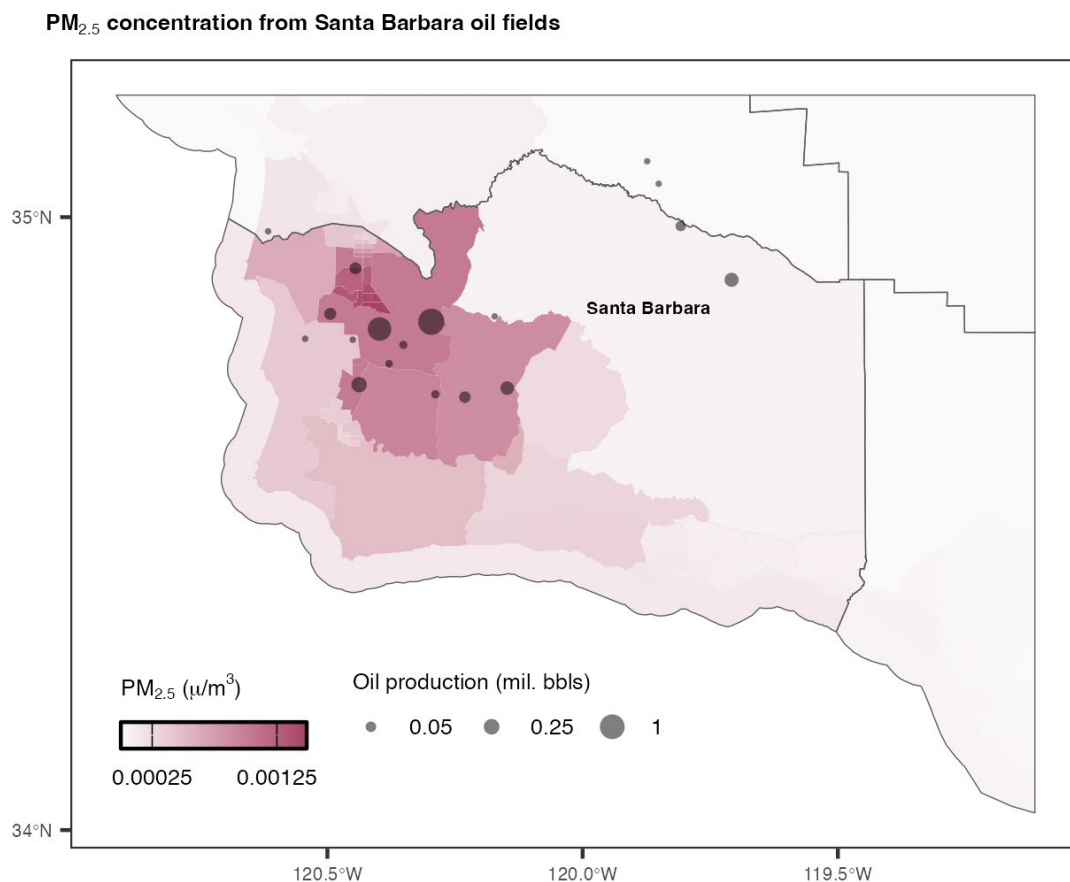


Figure 1. Particulate matter ($PM_{2.5}$) concentration by census tract for a 1 tonne pulse of $PM_{2.5}$ emissions from Santa Barbara oil fields. Points indicate location of 2019 oil production wells. Data sourced from Deshmukh et al. (2023).

Reduced oil production decreases risks to public health with economic benefits

When oil facilities are phased out, there is considerable avoided mortality due to reduced exposure to PM_{2.5} pollution. Deshmukh et al. (2023) modeled the health, economic, and climate impacts of various phaseout policy scenarios such as well setbacks, a carbon price, and an excise tax. Of these, well setbacks from sensitive receptors — such as schools, hospitals, and residential areas — were found to have the largest health benefits. Because setbacks prevent new drilling and accelerate the decline of existing wells, they function as a de facto phaseout policy, especially if they are applied to existing wells in addition to new wells. In particular, a one-mile setback — which is more restrictive than the 3200-foot setback imposed on new drilling from SB 1137 (2022) — closely approximates a relatively extreme oil well phaseout scenario in terms of potential health impacts given the atmospheric concentration of PM_{2.5} pollution around a given facility.* With a well setback distance of 1 mile the modeled avoided mortality cost in Santa Barbara County ranges between \$54 million and \$81 million by 2045 compared to a business-as-usual baseline.⁶

These numbers are an underestimation because they only consider mortality rates associated with PM_{2.5} pollution. These estimates would be significantly higher if morbidity was included along with mortality. Additionally, these numbers would be higher if they included other pollutants such as VOCs like benzene, a known carcinogen.⁷

2.2 Economic Impacts

Oil Phaseout Job-Losses in Context

The oil industry in Santa Barbara County currently employs a relatively small number of workers. Based on available data, crude petroleum extraction accounts for just 16-53 jobs, while drilling operations employ an estimated 11-23 people.⁸ Support activities for oil operations accounts for the largest share of employment in the sector, between 465 and 1,031 jobs. With a total local workforce of 209,500 jobs across all sectors county-wide, oil-related jobs make up just 0.23% to 0.54% of all employment in the region.

Jobs in the oil industry are high-risk and offer less stability than those in other industries. The oil and gas industry is known for its “boom-and-bust” cycles that undermines stable employment. In a recent industry survey, oil and gas workers reported severe job instability, declining wages and benefits, and safety concerns.⁹ Furthermore, the fatality rate for jobs in the oil and gas extraction industry is 7 times higher than other occupations, and the number of fatalities is rising.¹⁰

At the county-level, oil industry activity is not a panacea for unemployment. In fact, Kern County, which has 30 times more oil production than Santa Barbara County, has had a consistently higher unemployment rate (8.1% average)¹¹ compared to Santa Barbara County (~4.4% average)¹² from December 2023 through December 2024.

* See, for example, [“RE: Response to CalGEM Questions for the California Oil and Gas Public Health Rulemaking Scientific Advisory Panel.”](#)

How an oil phaseout aligns with a just transition for Santa Barbara County workers

Phasing out oil operations can create jobs. These jobs require skills that are closely aligned with production and extraction labor skill sets.¹³ Well decommissioning is a potential source of new employment for oil and gas workers. Asset repurposing through converting oil wells to high-temperature water wells for geothermal power generation can also provide new employment opportunities.¹⁴ Santa Barbara County has been identified as one of three within California particularly suited to this type of well re-use.¹⁵ Additionally, as the County works towards its climate goals, electrification and clean energy will provide a counterweight to lost fossil fuel jobs.

UC Santa Barbara faculty along with the Community Labor Center are currently conducting a study to estimate job loss and gain associated with the energy transition, including jobs lost by oil and gas phaseout, jobs gained by oil and gas well decommissioning and asset repurposing, and jobs gained from increased geothermal, wind, and solar installations. Preliminary results will be shared with the County in the upcoming months.

An oil phaseout poses minimal budgetary impact and has potential benefits

Oil production in Santa Barbara County has minimal impact on the county's existing budget. Quantifying the existing fiscal impacts of oil production is particularly difficult and unreliable, given the oft-overlooked secondary fiscal costs. For example, oil operations reduce the value of adjacent properties, leading to lower property tax revenue, with research showing declines between 10-30%.¹⁶

Additionally, oil-related activities impose significant costs on county resources, including fire and emergency response, road maintenance, and regulatory oversight.¹⁷ Companies often fail to cover the full cost of spills and may abandon sites, leaving state and local governments responsible for expensive cleanups.¹⁸ Despite these expenses, oil property taxes contribute only a fraction of the county's total revenue – just \$3.3 million or approximately 0.2% of county revenues in FY 2024-2025.¹⁹

Research on the long-term effects of oil and gas specialization on a local area suggests that oil and gas producing counties experience significant income declines if they maintain specialization for over a decade, losing up to \$7,000 per capita compared to those with only one year of specialization.²⁰

Further, counties with prolonged specialization in oil and gas experience up to 50 more violent and property crimes per 20,000 residents compared to similar counties with only one year of above-average income from oil and gas.²¹ This suggests that extended reliance on the industry may contribute to increased crime levels, which is consistent with other academic research. Education was also negatively impacted by a prolonged oil and gas economy with as many as 2.5% fewer adults with college degrees in a county versus a hypothetical identical county with only one year of specialization in oil and gas.²²

2.3 Environment and Climate Impacts

Estimated reductions in greenhouse gas (GHG) emissions

Oil and gas operations have a negative impact on the local environment. The vast majority of emissions associated with oil production come from direct extraction processes and, secondarily, from venting, flaring, and fugitive emissions.²³ As County oil fields become depleted due to decades of

extraction, carbon and energy intensive extraction techniques are required to access difficult to recover reserves. Cyclic steam and steam flooding techniques use steam generators that burn fossil fuels, generate GHG emissions, and create local air pollution. A GHG emissions analysis conducted by Rincon consultants estimated 132,355 MT CO₂e from oil and gas extraction processes in 2023 – an *increase* from 2018.²⁴ Additionally, this figure is likely an underestimate given challenges in precisely measuring methane and other non-CO₂ emissions from oil and gas operations.^{25,26,27}

Oil and gas well phaseout policies will help the County reduce GHG emissions and meet its stated climate targets. As previously mentioned, a one-mile setback distance effectively simulates a complete oil well phaseout scenario with respect to public health impacts. Research conducted at UCSB found that a well setback distance of 5,280 feet and 90% GHG emissions reduction could avoid 344,072 MT CO₂e by 2045 compared to a business-as-usual scenario.²⁸ These emissions are associated with only oil and gas extraction and do not include refining, processing, or facilities emissions or downstream fuel combustion emissions. Additionally, methane emissions are significantly underestimated in this CO₂e estimate.^{29,30,31} Therefore, emissions avoided due to a well setback are likely to be much greater than projected in this study.

Beyond climate-warming greenhouse gas emissions, oil production activities threaten to pollute County water sources. Oil extraction in proximity to the Santa Maria groundwater aquifer, which supplies drinking water for 200,000 people in the County, poses a risk to safe drinking water for residents. Water-intensive production competes with agriculture for land and water, which could drive up water and food prices. These activities also increase risk for disasters. Wastewater injection into the ground can trigger earthquakes. Oil production can cause spills that harm local wildlife and water supplies. Facilities also increase fire risk, which is exacerbated by drought.

Estimated economic benefits from reduced emissions

The costs of climate change continue to grow each year. The County is particularly at risk for fires, extreme heat exposure, and drought. The social cost of carbon estimates the cost on society per metric ton of CO₂e emitted. The difference in climate damages, as measured by the social cost of carbon, between the business-as-usual scenario and the most rapid well phaseout policy is valued at \$21.8 million (using a 3% discount rate).³²

3 Recommendations

3.1 Policy Options

Existing demand-side policies to reduce GHG emissions in Santa Barbara County are unlikely to address the negative public health, economic, and climate impacts of local oil and gas production described above.

Consistent with the spirit of state law AB 3233, we provide potential oil and gas phaseout policy options for Santa Barbara County. The following list draws on ordinances adopted in Los Angeles by the LA City Council, the LA County Board of Supervisors, by ballot initiative in Monterey County, and through other local efforts to regulate oil and gas operations in California.**

Key Provisions

1. **Prohibit New Extraction or Production Facilities:** No new permits for oil and gas drilling, redrilling, deepening of wells, or accessory production facilities shall be issued.
2. **Nonconforming Use Designation:** Existing oil and gas operations shall be classified as 'non-conforming uses' and will be subject to an amortization period before mandatory cessation and removal.
3. **Just Transition Support Policies:** Commission a workforce development study and subsequent programming to assist oil and gas industry workers in transition to other employment sectors, with particular support for transition to clean energy jobs.

** Although these and other measures have been invalidated by various Superior Courts and the California State Supreme Court as preemptive of state law, it is our understanding that AB3233 affirms the ability of cities and counties to regulate, limit, or prohibit proposed and existing oil and gas operations within their jurisdictions.

4 References

- 1 Attachment A.
- 2 Marlon, J. et al., "[Yale Climate Opinion Maps 2023](#)", December 2023.
- 3 Based on data from [WellSTAR](#).
- 4 EPA, "[Health and Environmental Effects of Particulate Matter \(PM\)](#)", July 2024.
- 5 American Lung Association, "[Volatile Organic Compounds](#)", October 2024
- 6 Deshmukh et al., "[Equitable low-carbon transition pathways for California's oil extraction](#)", Nature Energy, May 2023.
- 7 United States Environmental Protection Agency. Benzene. <https://www.epa.gov/sites/default/files/2016-09/documents/benzene.pdf>
- 8 Employees in relevant NAICS Industry Groups (2111 & 2131) [sourced](#) from the California Employment Development Department (EDD).
- 9 Milliken Biven, M and Leo Lindner, "[The Future of Energy & Work in the United States: The American Oil & Gas Worker Survey](#)", March 2023.
- 10 Wingate, Kaitlin C. et al., "[Fatalities in Oil and Gas Extraction Database, an Industry-Specific Worker Fatality Surveillance System – United States, 2014–2019](#)", CDC, September 2023.
- 11 Rios, L., "[Bakersfield Metropolitan Statistical Area \(MSA\) \(Kern County\)](#)", State of California Employment Development Department, January 2025.
- 12 Rios, L., "[Bakersfield Metropolitan Statistical Area \(MSA\) \(Kern County\)](#)", State of California Employment Development Department, January 2025.
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- 14 Jello, J., & Baser, T. "[Utilization of existing hydrocarbon wells for geothermal system development: A review](#)." Applied Energy, July 2023.
- 15 Caulk, R. & Tomac, I., "[Reuse of abandoned oil and gas wells for geothermal energy production](#)", Renewable Energy, Nov. 2017.
- 16 Krupnick, A. and Isabel Echarte, "[Housing Market Impacts of Unconventional Oil and Gas Development](#)", June 2017.
- 17 Newell, R. and Daniel Raimi, "[The fiscal impacts of increased U.S. oil and gas development on local governments](#)," Energy Policy, June 2018.
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- 20 Haggerty et al., "[Long-term effects of income specialization in oil and gas extraction: The U.S. West, 2980-2011](#)", Energy Economics, July 2014.
- 21 Ibid.
- 22 Ibid.
- 23 Rincon Report (Attachment B)
- 24 Rincon Report (Attachment B)
- 25 RMI, [Oil Climate Index plus Gas Model](#) v.2.1.0, April 2024
- 26 Masnadi et al., "[Global carbon intensity of crude oil production](#)", Science, August 2018.
- 27 Scarpelli et al., "[Updated Global Fuel Exploitation Inventory \(GFEI\) for methane emissions from the oil, gas, and coal sectors: evaluation with inversions of atmospheric methane observations](#)", Atmospheric Chemistry and Physics, March 2022.
- 28 Deshmukh et al., "[Equitable low-carbon transition pathways for California's oil extraction](#)", Nature Energy, May 2023.
- 29 RMI, [Oil Climate Index plus Gas Model](#) v.2.1.0, April 2024.
- 30 Masnadi et al., "[Global carbon intensity of crude oil production](#)", Science, August 2018.
- 31 Scarpelli et al., "[Updated Global Fuel Exploitation Inventory \(GFEI\) for methane emissions from the oil, gas, and coal sectors: evaluation with inversions of atmospheric methane observations](#)", Atmospheric Chemistry and Physics, March 2022.
- 32 Deshmukh et al., "[Equitable low-carbon transition pathways for California's oil extraction](#)", Nature Energy, May 2023.

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COUNTY OF SANTA BARBARA

August 15, 2024

The Honorable Dawn Addis
Member of the State Assembly
1021 O Street, Room 5350
Sacramento CA 95814

**RE: AB 3233 (Addis) – Oil and Gas Operations: Local Restrictions
As amended 6/19/2024 – SUPPORT
Set for Suspense File hearing 8/15/2024 – Senate Appropriations Committee**

Dear Assembly Member Addis:

On behalf of the Board of Supervisors in the County of Santa Barbara, I write in support of AB 3233, your measure that would permit a local government, irrespective of state authorization, to, by ordinance, (1) prohibit oil and gas operations in its jurisdiction or (2) impose regulations, limits, or prohibitions on oil and gas development that are more protective of public health, the climate, or the environment than those prescribed by a state law, regulation, or order. These limitations or prohibitions extend to the methods of oil and gas operations and the locations of oil and gas operations.

Oil and gas development has occurred in Santa Barbara County since as early as the 1890s. Given this history, the risks of potential spills, and the associated environmental and public health impacts, the County of Santa Barbara has adopted extensive policy related to oil and gas production. Additionally, and perhaps most importantly, the County's legislative platform recognizes the foundational governance principle of local control. It states that the County supports efforts to "ensure local authority and control over governance issues, land use policies and the delivery of services, including flexibility and customization in designing and implementing policies and services that are responsive to the community's preferences." Your measure certainly aligns with this important principle and, if enacted, would authorize *but not require* local governing bodies to impose limitations and restrictions related to oil and gas operations. Importantly, this local authority under the provisions of AB 3233 in a given jurisdiction would require a separate official act of the local governing board to exercise this regulatory power.

There is a considerable body of state law around oil and gas operations. AB 3233 would appropriately clarify and affirm that local governments have the independent authority and ability to restrict and otherwise limit oil and gas operations to meet local needs.

The County of Santa Barbara is pleased to support AB 3233. We thank you for your leadership on this important policy matter.

Sincerely,

A handwritten signature in blue ink, appearing to read "Elizabeth Espinosa", with a stylized flourish at the end.

Elizabeth Espinosa
Legislative Advocate

cc: Honorable Members, Santa Barbara County Delegation

Attachment B: Santa Barbara County Petroleum Production Activity GHG Emissions Analysis by Rincon Consultants, Inc.



RINCON CONSULTANTS, INC. SINCE 1994

Rincon Consultants, Inc.

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Ventura, California 93003
805-644-4455

M E M O R A N D U M

Date: January 9, 2025

To: Garrett Wong
Climate Program Manager
County of Santa Barbara
gwong@co.santa-barbara.ca.us

Via: Email

From: Ryan Garder
Climate Planning Director
rgardner@rinconconsultants.com

Subject: Santa Barbara County Petroleum Production Activity
GHG Emissions Analysis

Project Number: 20-09336

Preliminary Santa Barbara County Petroleum Production Activities Greenhouse Gas Emissions Inventory and CAAP Impact Analysis

This technical memorandum presents the preliminary results of an investigation into the available data and resulting inventory of greenhouse gas (GHG) emissions produced by oil and gas activities in Santa Barbara County (the County). The scope for this analysis included a review of the available datasets and resulting emissions over time resulting from the processes of extraction, transportation and refining of petroleum products. This analysis includes both onshore and offshore oil extraction activities within the County and the Santa Barbara Channel. Oil production activities have occurred in the area of Santa Barbara County for well over 100 years. However, production in the County has been in decline since the 1980s and much of the region has been transitioning away from the oil production past. Today, oil production is a small fraction of the overall economy in Santa Barbara County.¹

For the County oil and gas GHG emissions inventory, Rincon collected and analyzed data from the following publicly available regulatory data sources:

- California Air Resources Board (CARB)
- California's Department of Conservation Geologic Energy Management Division (CalGEM) WellSTAR database.
- CARB Low Carbon Fuel Standard Carbon Intensity Scores by Oil Field

Rincon collected and collated available data for historic calendar years between 2005 and 2023 as available. One of the challenges for quantifying GHG emissions related to the petroleum industry is the aggregation of various data sources and the distribution of available data for each stage of the

¹ <https://www.govinfo.gov/content/pkg/GOVPUB-I-2cda7e2ddea58e6ed2d24c68f6b77cc4/pdf/GOVPUB-I-2cda7e2ddea58e6ed2d24c68f6b77cc4.pdf>



extraction, transportation, and refining process across multiple government agencies. Furthermore, no single dataset exists that provides a complete picture of all oil and gas related emissions within the County. This analysis investigated two different approaches to quantify GHG emissions within the County in a repeatable and transparent manner.

California Air Resources Board (CARB) Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR) database Analysis

The first approach Rincon explored was to leverage the CARB MRR emissions database. The County of Santa Barbara has been using the MRR data to track oil and gas emission historically and was therefore included in this analysis. This is considered a top-down analysis since it provides emissions at a facility level and aggregates multiple emissions sources occurring at each facility. The MRR data provides a broad analysis of the overall emissions generated by facilities which emit over 10,000 MT CO₂e (metric tons of carbon dioxide equivalent) per year. To utilize this data for oil and gas inventory purposes Rincon first identified all facilities reporting to the MRR and filtered for facilities with zip codes and location within Santa Barbara County. The oil and gas related facilities (production and refining) located in the County and total GHG emissions for 2018 and 2023 can be found in Table 1 and Table 2 respectively. This table only includes facilities (including oil fields) which emit over 10,000 MT CO₂e (the reporting threshold) and therefore, is not exhaustive of oil and gas activities in the County.

Table 1 Top-down 2018 Petroleum Industry GHG Emissions Inventory

ARB ID ¹	Facility Name	MT CO ₂ e
104458	ERG Operating Company, LLC. 750 Santa Maria Basin	38,292
104459	ExxonMobil POPCO Facility	0
101674	Pacific Coast Energy Company LP	34,993
104381	Santa Maria Energy, LLC, Careaga Lease	13,139
104766	Sierra Resources Santa Barbara Basin	14,408
104783	Vaquero Energy - Santa Barbara County	22,154
104460	ExxonMobil LFC Facility	1
101155	Greka Santa Maria Refinery	15,218
Total		138,205

Source: <https://ww2.arb.ca.gov/mrr-data>

¹Air Resources Board Identification

Table 2 Top-down 2023 Petroleum Industry GHG Emissions Inventory

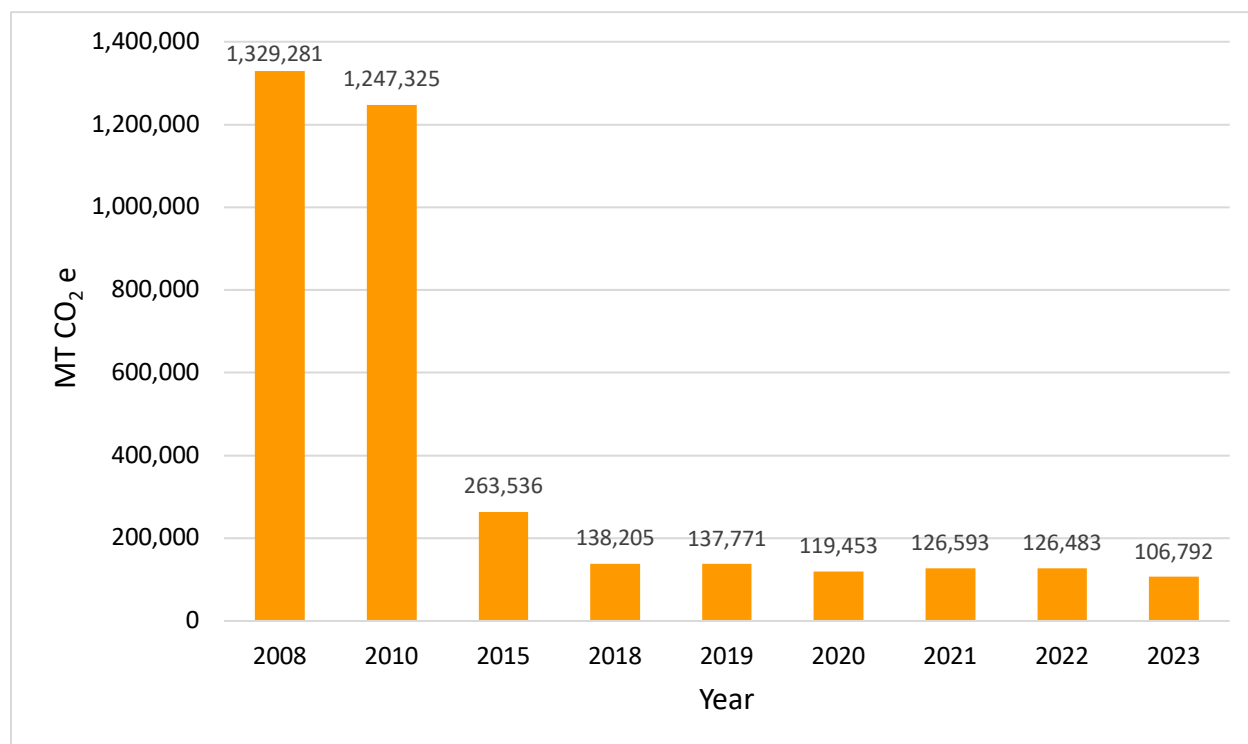
ARB ID ¹	Facility Name	MT CO ₂ e
104458	Cat Canyon Resources 750 Santa Maria Basin	56,761.25
101674	Pacific Coast Energy Company LP	38,339.15
104460	Sable LFC Facility	0.15
104766	Sierra Resources Santa Barbara Basin	8.12
104783	Vaquero Energy - Santa Barbara County	11,683.27
Total		106,791.95

Source: <https://ww2.arb.ca.gov/mrr-data>

¹Air Resources Board Identification

Rincon also completed this analysis for historic years to help identify the trend in emissions over time using the MRR top-down data collection approach. Between 2008 and 2023 oil and gas emissions from facilities reporting to the MRR have decreased by 74% from 403,791 MT CO₂e down to 106,792 MT CO₂e. During this time multiple oil and gas extraction and refining operations have come offline or reduced their emissions to below the 10,000 MT CO₂e reporting threshold, including operations run by Aera, Exxon, and others. These facilities may still produce oil and gas but are not captured by the MRR. Figure 1 shows the changes in GHG emissions from the oil and gas sector based on the MRR data between 2008 and 2023.

Figure 1 Oil and Gas Emissions in Santa Barbara County over Time (MRR)



Data Limitations

While the MRR dataset provides data on a wide range of oil and gas related activities including oil and gas production as well as refining, it does have several limitations. The primary limitations include:

- Only provides total GHG emissions data by facility;
- Does not provide barrels of oil extracted;
- Does not differentiate GHG emissions from different oil fields; and
- Only captures facilities above 10,000 MT CO₂e, so small producers may not be captured.

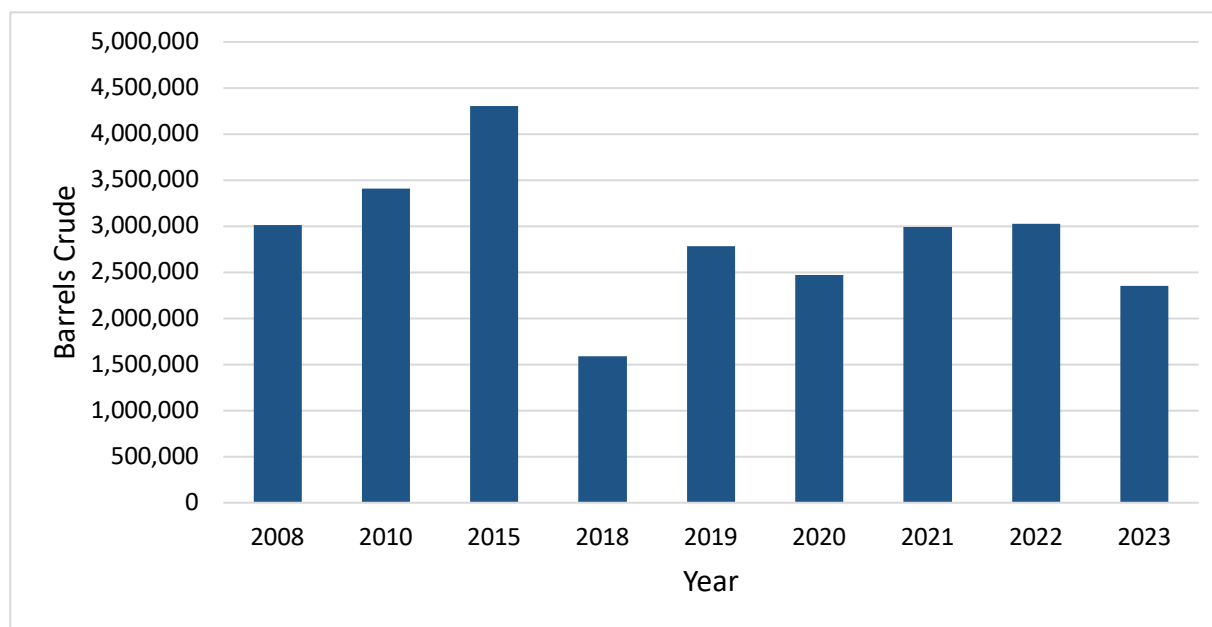
As oil and gas production continues to decline, additional facilities may fall under the 10,000 MT CO₂e threshold. Therefore, Rincon investigated additional datasets in order to provide a more comprehensive look at oil and gas activities within the County.

CalGEM WellSTAR Database Analysis

Due to the limitations of the MRR data as a single source of oil and gas emissions data, Rincon also conducted a review of other oil and gas emissions data that is publicly available, consistent, and transparent. Based on these criteria, Rincon identified the CalGEM WellSTAR database and the CARB low carbon fuel standard (LCFS) crude average carbon intensity (CI) values. This data provides a summary of every barrel of oil produced within the County as well as the carbon intensity of each oil field. When combined, this data provides a bottom-up analysis of oil and gas production from individual wells in Santa Barbara County. Total barrels of oil condensate produced were summed for each oil field located in the County. To estimate GHG emissions occurring due to oil and gas extraction, the CARB LCFS program CI scores were then applied to production from each oil field. The LCFS program carbon intensities include emissions from oil extraction and transportation (but not refining) for each specific oil field. The data is for all oil fields in the County, regardless of total production or emissions, providing a more comprehensive picture of oil and gas production in the County than the MRR. While the CI score is in MT CO₂e per barrel of oil, this score would also include the extraction of natural gas which is a byproduct of oil production in the County. The calculated total GHG emissions for the bottom-up analysis was 98,868 MT CO₂e in 2018 and 132,355 MT CO₂e in 2023 (Tables 1-2).

WellSTAR production data was available back to 2008. WellSTAR production data show a large increase in production from 2008 through 2015, with a sharp decline in production reflected by 2018, and then a smaller increase and variable production through 2023 (**Error! Reference source not found.**). This reduction after 2015 likely reflects the impacts of the 2015 Refugio oil spill which caused the shutdown of offshore oil production through the Gaviota Offshore field. Since the oil spill, production has been significantly lower and had zero production in 2008 and 2023. Many other factors could have contributed to the ongoing fluctuation in production, including economic factors, well depletion, or wells retiring or idling. Based on this data, Rincon completed a detailed emissions analysis for 2018 (CAAP baseline year) and 2023 (most current year).

Figure 2 Oil Production from Santa Barbara County Over Time (WellStar)





The methods outlined above were applied to both the 2018 and 2023 WellSTAR production numbers to calculate total GHG emissions from oil and gas extraction processes in the County. The bottom-up analysis estimated total GHG emissions for 2018 at 98,868.39 MT CO₂e (Table 3), compared to 132,355.90 MT CO₂e in 2023 (Table 4). While oil production increased by 48% between 2018 and 2023, emissions only increased by 34%. The discrepancy between the reduction in crude oil production and the decrease in GHG emissions is attributed to a higher average CI per barrel in 2018 compared to 2023.

Table 3 Bottom-up 2018 Petroleum Industry GHG Emissions Inventory

Field Name	Oil Condensate Produced (barrels)	Carbon Intensity (g CO ₂ e/MJ) ¹	MT CO ₂ e
Barham Ranch	26,877	4.15	680.39
Capitan	17,549	11.12 ²	1,190.38
Careaga Canyon	2,796	11.12	189.66
Casmalia	63,672	10.26	3,984.98
Cat Canyon	689,718	7.83	32,943.00
Cuyama South	107,909	14.70	9,676.20
Elwood	2,742	11.12	186.00
Four Deer	764	11.12	51.82
Gaviota Offshore	0	11.12	0
Goleta	0	11.12	0
Guadalupe	0	11.12	0
Harris Canyon Northwest	0	11.12	0
Jesus Maria	2,908	11.12	197.26
La Goleta Gas	2,104	11.12	142.72
Lompoc	60,822	28.45	10,555.35
Los Alamos	1,254	11.12	85.06
Orcutt	450,083	11.76	32,287.15
Point Conception	0	11.12	0
Refugio Cove Gas	2,494	11.12	169.17
Russell Ranch	11,412	8.58	597.28
Santa Maria Valley	94,362	4.80	2,762.92
Zaca	13,141	9.53	763.93
Unknown Field	35,457	11.12	2,405.12
Total	1,586,064		98,868.39

Source: <https://wellstar-public.conservation.ca.gov/>

¹ grams of CO₂ equivalent per megajoule

²Average carbon intensity value for Santa Barbara County oils fields in 2018



Table 4 Bottom-up 2023 Petroleum Industry GHG Emissions Inventory

Field Name	Oil Condensate Produced (barrels)	Carbon Intensity (g CO ₂ e/MJ) ¹	MT CO ₂ e
Barham Ranch	26,383	4.15	667.89
Capitan	21,433	9.27 ²	1,211.97
Careaga Canyon	2,991	9.27	169.13
Casmalia	72,460	10.26	4,534.98
Cat Canyon	1,120,996	7.83	53,542.13
Cuyama South	145,375	14.7	13,035.78
Elwood	2,130	9.27	120.45
Four Deer	4,333	9.27	245.02
Gaviota Offshore	0	9.27	0
Goleta	0	9.27	0
Guadalupe	440	9.27	24.88
Harris Canyon Northwest	0	9.27	0
Jesus Maria	1,648	9.27	93.19
La Goleta Gas	2,945	9.27	166.53
Lompoc	48,992	9.27	2,770.35
Los Alamos	12,092	11.78	868.91
Orcutt	626,683	11.76	44,955.73
Point Conception	2,695	9.27	152.39
Refugio Cove Gas	1,282	9.27	72.49
Russell Ranch	18,821	8.58	985.05
Santa Maria Valley	177,938	4.8	5,210.02
Zaca	31,937	9.27	1,805.94
Unknown Field	29,640	9.53	1,723.06
Total	2,351,214		132,355.90

Source: <https://wellstar-public.conservacion.ca.gov/>

¹ grams of CO₂ equivalent per megajoule

²Average carbon intensity value for oil fields in Santa Barbara County in 2023



Data Limitations

While the WellSTAR data combined with the LCFS data provides a finer grain look at the oil and gas production emissions in the County of Santa Barbara, it also has several deficiencies that must be addressed.

- Only 9 of the 23 County oil fields have CARB-verified CI values
 - For the remaining 14 oil fields, it was necessary to use an average oil field CI for Santa Barbara County;
- Historic CARB LCFS CI data are not available prior to 2014;
- LCFS emission factors only include emissions from oil and gas production and transportation (no refining, if applicable in a given year); and
- Natural Gas extraction emissions are likely included (as a biproduct of oil extraction) but transportation is not.

To address one of the largest issues, the lack of oil refining emissions data, a hybrid approach can be employed. By adding refining emissions data from the MRR and combining that information with the bottom-up production data the most complete picture of oil and gas emissions can be provided. The final emissions from this approach are shown below in Table 5.

Table 5 Hybrid Emissions Approach Results

Year	WellSTAR Production Emissions	MRR Refining Emissions	Total Emissions
2018	98,868	15,218	114,086
2023	132,356	0.0	132,356

Sources of Emissions within Oil and Gas Extraction

Santa Barbara County oil fields are characterized by a long history of extraction causing depletion in the oil field and the necessity to utilize increasingly energy intensive extraction techniques to continue production. The Cat Canyon oil field is a good case study in the evolution of oil extraction in the County. The Cat Canyon oil field is located in the Santa Maria Basin, overlying the Monterey and Sisquoc formations. Oil in Cat Canyon was initially discovered in 1908, and by 1938 typical daily production was approximately 700 barrels.² Today there are over 500 wells in the Cat Canyon oil field, and many wells lie dormant or plugged. Continuing extraction there requires tertiary oil recovery techniques such as thermal injection, gas injection, and/or chemical injection, as at many fields across the County.³ Consequently, oil production at Cat Canyon is carbon and energy intensive, requiring a combination of cyclic steam injection and acidizing techniques to access the remaining heavy, viscous crude oil reserves that were unrecoverable using less energy intensive primary and secondary⁴ extraction

² Roehl and Weinbrandt 1985. Geology and Production Characteristics of Fractured Reservoirs in the Miocene Monterey Formation, West Cat Canyon Oilfield, Santa Maria Valley, California.

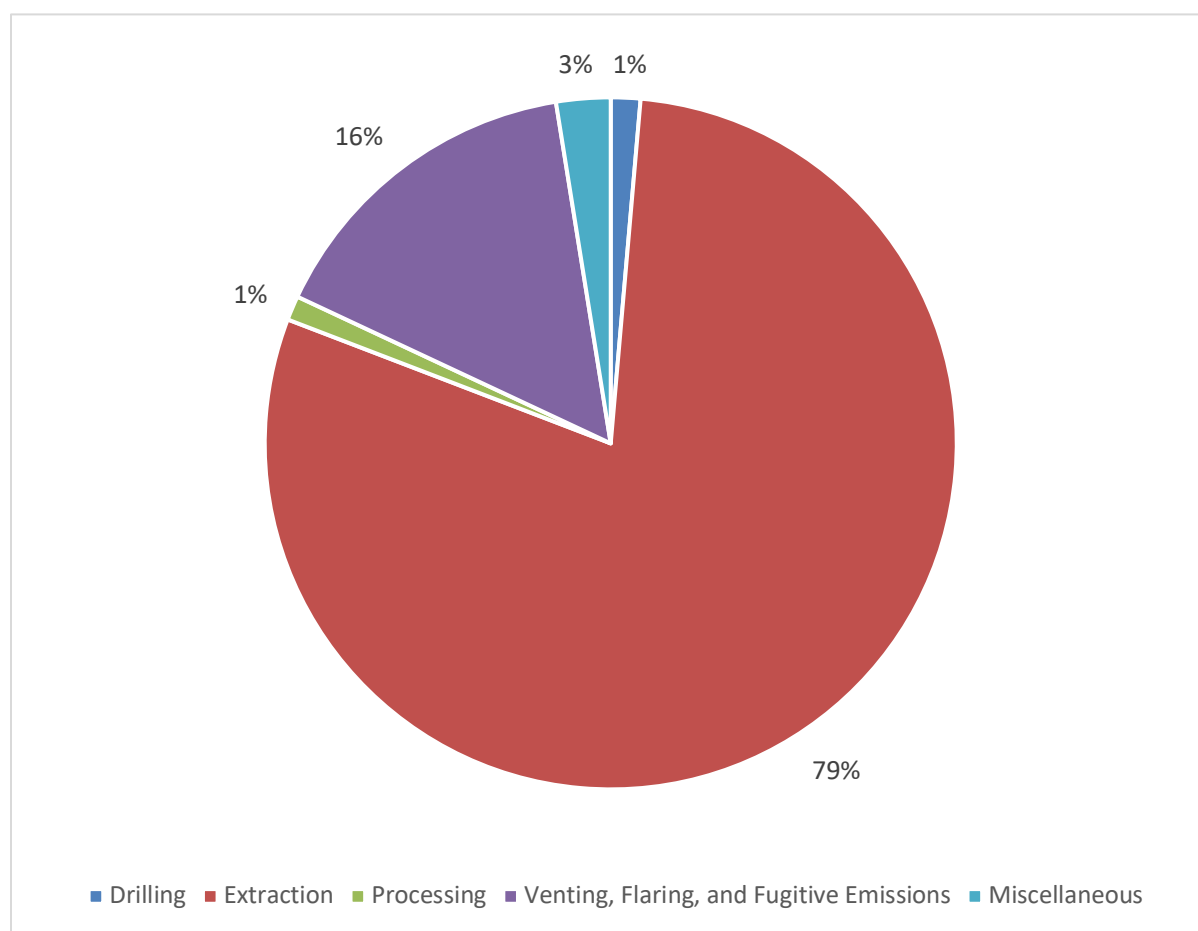
³ Tennyson, M.E., 2005. Growth History of Oil Reserves in Major California Oil Fields During the Twentieth Century. Bulletin 2172-H. US Geological Survey.

⁴ Primary extraction relies on the natural pressure within the reservoir to bring oil or gas to the surface, while secondary extraction methods are employed when natural pressure is insufficient and consist of water and/or gas injection to displace crude oil

methods.⁵ In 2023, CARB reported that the CI value for oil extracted from Cat Canyon was 7.83 g CO₂e/MJ, and that 175,529 barrels were produced. The trend is similar in other major oil fields in the County: in 2023 the greatest number of barrels were extracted from Orcutt oil field, which has a CI value of 11.76 g CO₂e/MJ.

Rincon used data from the Oil Climate Index to further breakdown the oil production process and provide emissions by activity.⁶ Most emissions resulting from oil and gas production in Santa Barbara County come from the extraction process which includes generating steam or other methods for loosening and removing oil from the basin. The other large source is flaring which includes combusting gases like methane which are released by the extraction process. The emissions by activity for oil and gas production are included in Figure 3.

Figure 3 Emissions from Oil Production By Activity



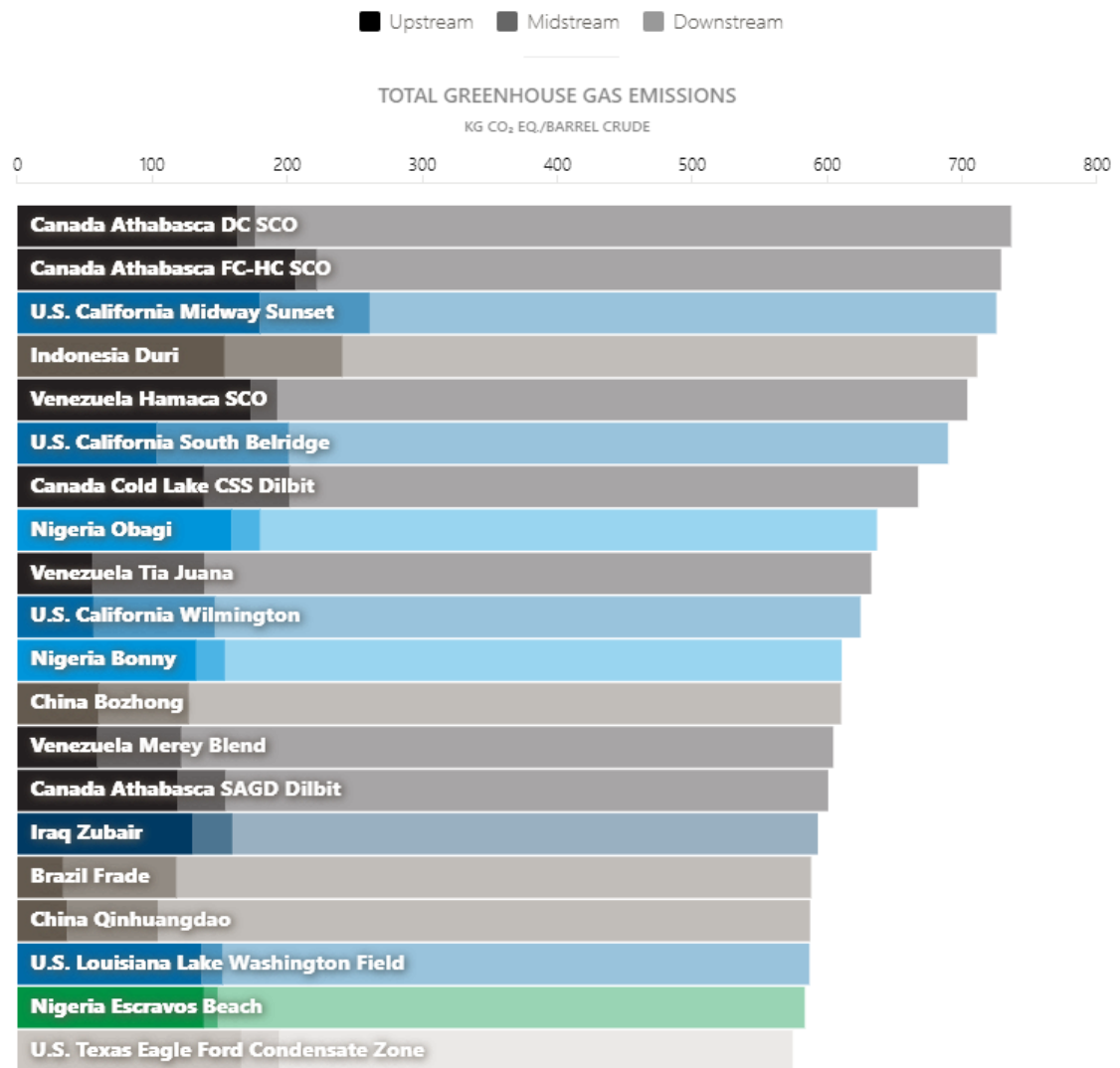
Due to the depletion of the County oil fields and relatively high GHG emissions necessary for extraction compared to global oil fields (Figure 4), extracting crude oil from Santa Barbara County oil fields is

⁵ Partridge, T., Barandiaran, J., Walsh, C., Bakardzhieva, K., Bronstein, L. and Hernandez, M., 2020. California oil: bridging the gaps between local decision-making and state-level climate action. *The Extractive Industries and Society*, 7(4), pp.1354-1359.

⁶ <https://oci.carnegieendowment.org/>

becoming increasingly unsustainable. California state crude oil production has declined steadily since 1985.⁷ Similarly, oil production in the County has decreased in recent years, from its peak in 2015 (Figure 4~~Error! Reference source not found.~~). As crude production has decreased, the number of idle wells in the County has increased (Figure 5). Idle wells are both an environmental concern and an end-of-life cost to well operators (and potentially to the County). The State and County's active wells will change to idle status as crude oil production naturally declines and the State and County shift away from fossil fuels and toward renewables. The County could focus their efforts on removing idle wells and limiting new extraction processes while the remaining operating wells phase out over time.

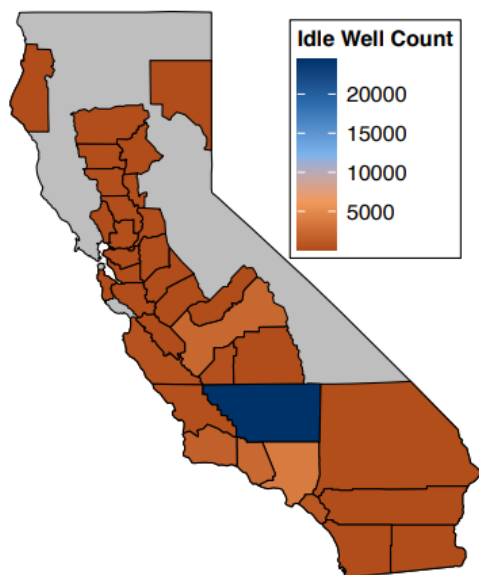
Figure 4 Total GHG emissions per barrel crude for 20 global test oils (Oil-Climate Index)



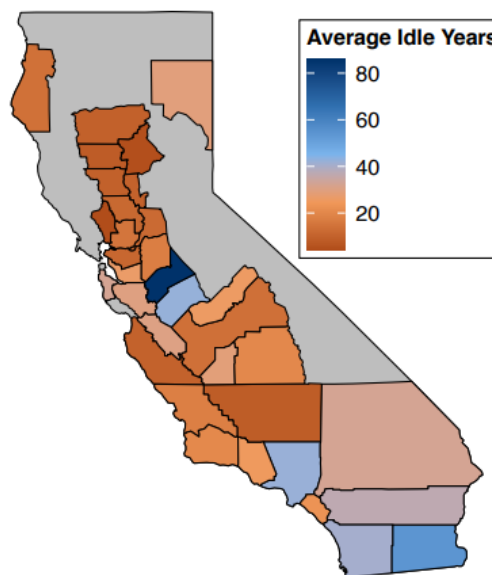
⁷ California Energy Commission, 2022. Petroleum Watch, March 2022.

Figure 5 Number of idle wells in California by county (2020)

IDLE WELL COUNTS



AVERAGE YEARS IDLE



Source: CEC analysis of California Geologic Energy Management (CalGEM) data

Notes: Offshore Idle Wells included for the following counties: Los Angeles, Orange, Santa Barbara, Ventura



Discussion of Results

Both datasets are generated differently, and neither is transparent enough to determine what differences result in different GHG emissions in any given year. Both are high-quality datasets managed by the State and verified by third parties. However, the use of WellSTAR data in conjunction with refinery data from the MRR provides both a wide range of emissions sources as well as more detail into areas of oil production and overall production trends.

In general, both MRR emissions and WellSTAR production values have declined over time. Based on the data available, it appears that a decrease in offshore oil extraction as well as the end of refining operations caused the largest decline in overall emissions while oil and gas extraction peaked in 2015 and has since been decreasing. However, 2018 was an unusually low oil production and GHG emissions year for the County of Santa Barbara. Using the recommended approach of combining WellSTAR production data with refinery emissions from the MRR the total 2018 GHG emissions were 114,086 MT CO₂e. In 2023 emissions increased to 132,356 MT CO₂e due to an overall increase in production (though a decrease in refinery emissions with the closure of Santa Maria Refinery).

Therefore, when just looking at the CAAP baseline year of 2018 and the most recent year (2023), it appears that oil and gas emissions have increased in the County. When taking a longer view (using 2008 for example) emissions have been trending down due to a decrease in production and the closure of refining operations.

Expected Impacts from Adding Oil and Gas Emissions on Communitywide Inventory, Targets, and CEQA Streamlining

Expected Impacts to Communitywide Inventory, Forecast and Targets

Adding oil and gas emissions to the County's community inventory would have several impacts. The primary impacts would be increasing the baseline and current inventory emissions, forecast, and targets. Furthermore, Including oil and gas would make achieving the target more difficult because both the County's stretch target and SB32 consistent target are based on 2018 baselines. Because 2018 oil and gas GHG emissions were at an all-time low, by 2023 emissions have increased by 18,269 MT CO₂e.

This variability in oil and gas emissions is one reason including oil and gas in the CAAP poses a challenge to the County's ability to achieve their GHG reduction targets. The addition of oil and gas could also decrease focus/investment on other sectors over which the County has more direct control.

Expected Impacts to County Climate Action Plan

After the GHG inventory and targets are updated, Rincon would need to re-evaluate the measures and actions within the CAP to ensure that substantial evidence would be available to demonstrate the County would meet the targets. Additional GHG reductions would be needed to both offset the 18,269 MT CO₂e increase as well as reduce additional emissions to make up for the addition of oil and gas to the inventory and achieve the reduction targets.

Expected Impacts to the CEQA analysis

Due to the substantial changes to inventory, forecast, targets, and measures and actions, the CEQA analysis would need to be updated and recirculated for the standard 30-day public review period.



Sincerely,
Rincon Consultants, Inc.

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Principal in Charge

Lily Momper, PhD
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