

# Measure or Estimate?

Some Food For Thought.

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(THE VIEWS EXPRESSED ARE PURELY THE AUTHOR'S AND DO NOT BIND THE INSTITUTION IN ANY WAY)

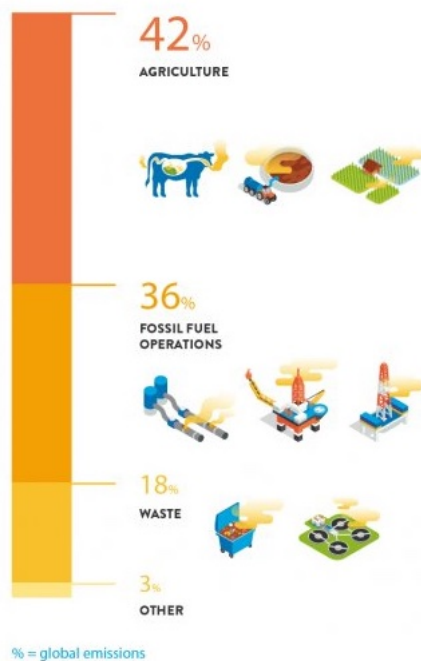


Peter Drucker

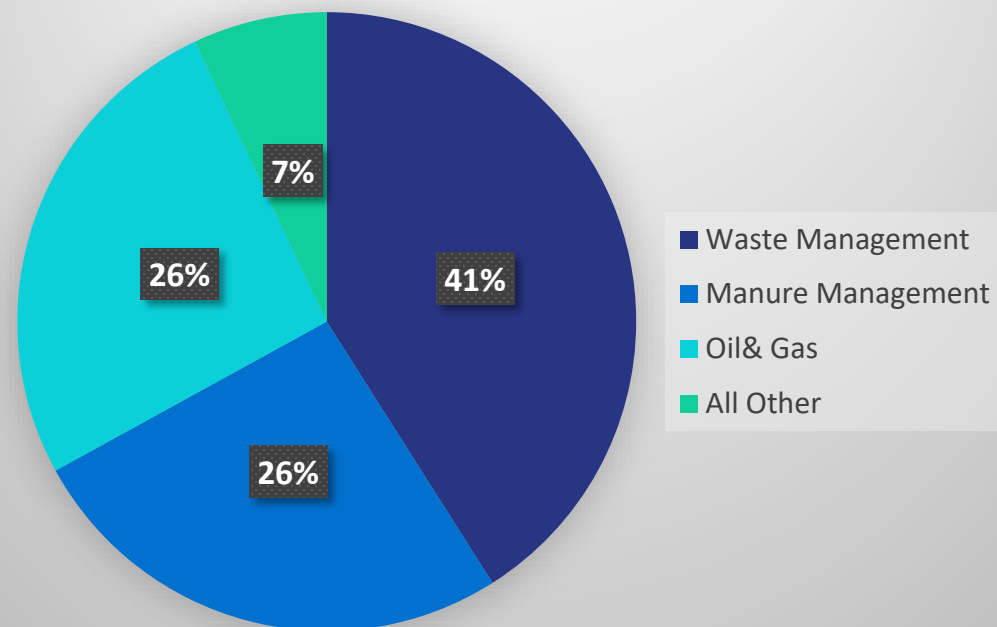
Your #1 business mistake is that you're running your business blind!

#### SOURCES

Methane is one of the fastest growing greenhouse gases in the atmosphere. Human activity causes 2/3 of emissions.



### FINDINGS FROM THE NASA/JPL CALIFORNIA METHANE SURVEY (2016-2017)



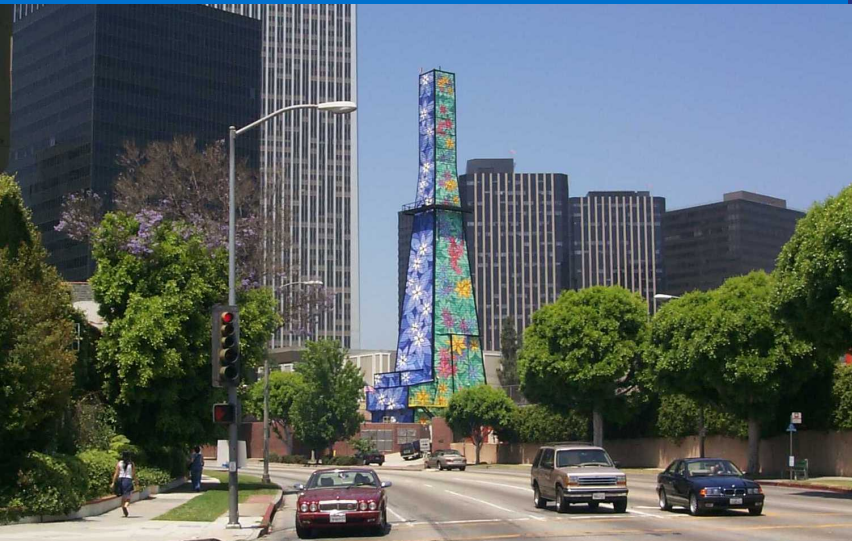
# JPL/NASA Survey in California key takeaways 1

- ✓ Less than 0.2% of infrastructure elements in the state (based on a survey of 272,000 facilities and components) are responsible for 34–46% of total methane emissions in California.
- ✓ Waste management is the largest methane point source emission sector in California (41% of our study total), driven by a small fraction of landfills; we only observed these plumes at 30 out of 270 surveyed facilities.
- ✓ Methane point source emissions from manure management at large dairies and the oil and gas sector each contributed about 26% of emissions in our study.
- ✓ Nearly 70% of the observed oil and gas point source emissions were associated with oil production in the southern San Joaquin Valley.
- ✓ Our methane emission estimates for petroleum refineries in California are 4.5 times higher than those reported to the EPA.
- ✓ **In comparing the California data with an earlier short-duration survey of the Four Corners region using the same methods we see very similar patterns, despite large differences in industrial activity between the two regions.**
- ✓ If similar patterns occur in other key regions globally we estimate that methane super-emitters could account for up to 10% of the climate forcing from greenhouse gas emissions



# JPL/NASA Survey in California key takeaways 2

- ✓ A relatively small number of high-emitting methane point sources contribute 20 to 50% of total methane emissions in regions surveyed so far.
- ✓ This “super-emitter” activity occurs in multiple economic sectors including energy, waste management and agriculture, with significant regional variations.
- ✓ Many methane point sources are highly intermittent and variable – on average they are only active about 25% of the time; this underscores the need for frequent monitoring.
- ✓ Frequent measurements over large areas can help separate persistent activity (including potential leaks) from more intermittent activity (either infrequent anomalies or planned maintenance events).
- ✓ High resolution remote sensing of methane plumes can pinpoint emissions sources and identify specific equipment for efficient follow up by facility operators and regulators.
- ✓ Accurate quantification of regional methane budgets/inventories benefits from tiered observing systems that apply multiple measurements from different vantage points (e.g., land, air and space) to provide a complete picture of the different types of emitters, including strong point sources and wider area sources.





# JPL/NASA Survey FINDINGS FROM THE 2019 PERMIAN METHANE SURVEY

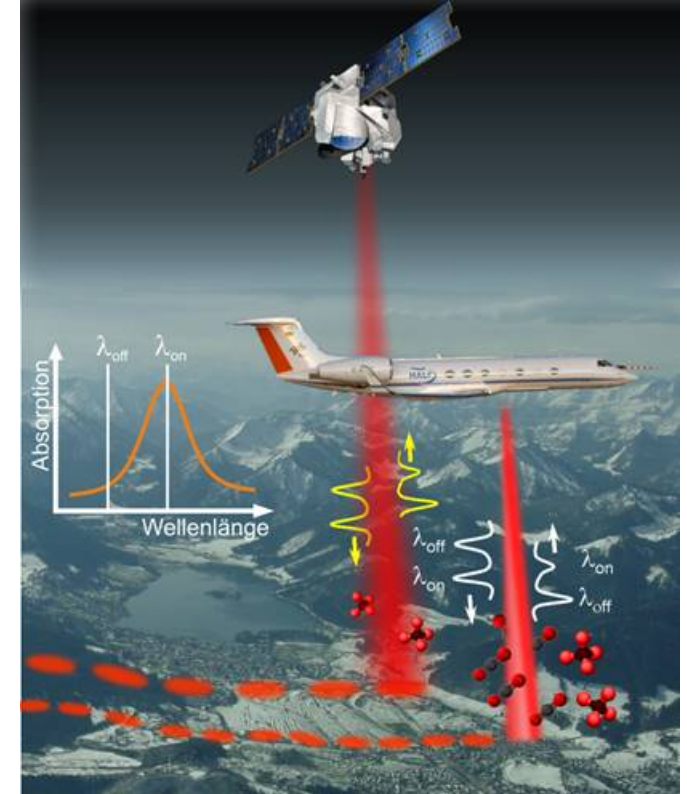
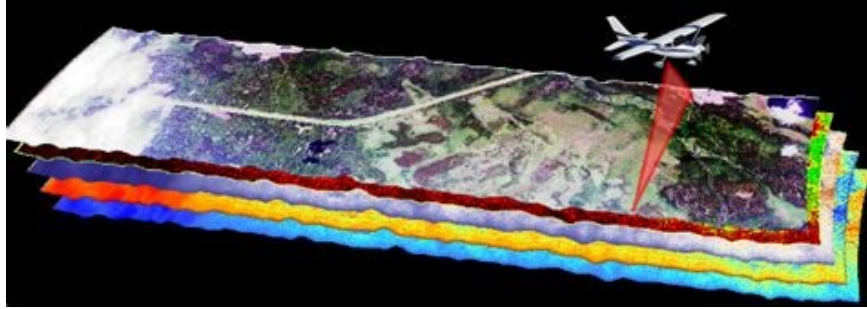
- ✓ We found about 1700 high-emitting methane point sources above our detection limit from oil and gas production, gathering and processing activity in an area spanning about 55,000 km<sup>2</sup> in Texas and New Mexico.
- ✓ **The population of methane sources above our detection limit in the Permian is significantly skewed (higher) compared to equivalent populations of oil and gas emissions from similar studies in California and Four Corners (San Juan basin).**
- ✓ Repeated sampling reveals that about half of the emissions from sources above our detection limit in the Permian come from sources that are active < 25% of the time (many of which are likely expected process-emissions such as periodic venting).
- ✓ The remaining half of emissions from that population comes from sources active 25-100% of the time; in general these are much higher emitting sources and many are potentially malfunctions or leaks, suggesting opportunities for mitigation.
- ✓ The total emissions from Permian point sources above our detection limits varies by a factor of 2 from day to day and that variability is twice as large as the total emissions from an equivalent point source population of oil and gas emitters in California.
- ✓ We used our high-resolution methane images to pinpoint the equipment types responsible for high-emitting point source emissions in the Permian, revealing a 20% shift in emissions from upstream to midstream activity compared to previous studies of all US oil and gas basins; we attribute this to over-production in the Permian (production is outpacing haul-away capacity).
- ✓ **Using spectroscopy to detect flaring stacks we were also able to attribute 12% of emissions from our population of Permian methane point sources to active flaring (incomplete combustion) and unlit flares, many of which have very large emissions (>1000 kgCH<sub>4</sub>/hr).**



It will not be easy,  
but it has to be  
done. Bureaucratic  
inertia will be a  
problem.



- ✓ The recently released Environmental Impact Report (EIR) for the Ventura County General Plan states that the County will not count the leaked methane documented from the NASA-JPL aerial surveys “because there is lack of consensus among scientific experts on a technical definition for “super emitter” sources.” It then provides citations that appear to support this reason. See the full quote below from the EIR Master Responses page 2-11.
- ✓ This decision to not count super emitter methane plumes from fixed sources or to launch a process to mitigate them results in under-counting them in the Greenhouse Gas Inventory in the EIR. Hence, the County has reduced that part of the inventory based on only using the models from CA Air Resources Board. This hides these GHGs from everyone and reduces the county’s responsibility to achieve net-zero emissions. It omits needed policy and a program for monitoring and cleaning up these methane leaks.
- ✓ The reason given is semantic and not substantive. It misleads the reader into assuming that nothing can be done about documented methane plumes so we should ignore this significant negative environmental impact. It dismisses the ample description in the United Nations Best Practices reference cited in the EIR that there is a way to compare top-down and bottom-up and various models in an uncertainty analysis because there are usually multiple values for a parameter. Because scientists are struggling with the best ways to synthesize the data does not mean that we can ignore a substantial amount of climate forcing methane gas.
- ✓ <https://world.350.org/ventura/2020/07/13/ventura-county-plan-eir-says-methane-super-emitters-dont-count/>



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“IF YOU CAN’T MEASURE IT, YOU CAN’T IMPROVE IT.” (PETER DRUCKER)

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