

Absolute Emissions from the Permian Basin Declined Nearly 20% Since 2022, Even as Oil and Gas Production Grew, New S&P Global Commodity Insights Analysis Finds

HOUSTON, Oct. 9, 2025 /PRNewswire/ -- Absolute greenhouse gas emissions from the Permian basin—one of the most prolific oil and gas fields in the world, responsible for 40% of total production in the United States—declined every year since 2022, even as production of oil and gas increased, according to a [new analysis](#) by S&P Global Commodity Insights.



Absolute greenhouse gas (GHG) emissions from the Permian declined by 25 million metric tons of carbon dioxide equivalent (MMt CO₂e) during the years 2022-2024, a 20% reduction during a period when oil and gas production increased by the equivalent of 500,000 barrels per day.

Although the GHG intensity of oil and gas activity—the ratio of emissions per barrel produced—in the basin has consistently declined over the past several years, the reduction in absolute emissions during a period of production growth was a surprise, the analysis says.

"This is a whole new ballgame," said Kevin Birn, Head of the Center for Emissions Excellence, S&P Global Commodity Insights. "Major Permian producers have a long track record of improvements from an emissions per barrel standpoint, but at the end of the day more barrels produced typically means more emissions. However, over the past few years in the Permian, more barrels came with lower emissions. It's a have-your-cake-and-eat-it-too moment."

The biggest factor in the overall emissions reduction has been the improved detection and mitigation of methane, the analysis says. A more potent greenhouse gas, methane emissions account for approximately two-thirds of total emissions in the Permian.

Improved operations, better equipment and the utilization of artificial intelligence and other advanced technologies reduced the methane intensity of Permian production by more than 50% during the 2022-2024 period, according to a previous S&P Global Commodity Insights [analysis for Permian upstream methane](#). The scale of methane reduction outpaced the impact of production growth leading to absolute emissions declining.

"The introduction of higher quality observational data in recent years not only establishes a more credible baseline against which to measure emissions mitigation, it enables technologies and practices that allow producers to improve those efforts, or to even anticipate and prevent emissions altogether," said Raoul LeBlanc, Vice President, Global Upstream, S&P Global Commodity Insights. "Data show methane emissions management is being increasingly normalized as part of field operations and that is driving methane down."

The new analysis—which includes methane and carbon dioxide emissions to provide a more complete assessment of the GHG emissions for the Permian—finds that the basin produced nearly 11 million barrels of oil at an average GHG intensity of 22 kilograms of carbon dioxide equivalent per barrel of oil equivalent produced (equivalent to 3.8gCO₂e/MJ) in 2024.

However, intensity varied widely from one well to another, ranging from more than 160 kgCO₂e/boe (28 gCO₂e/MJ) to less than 4 kgCO₂e/boe (0.69 gCO₂e/MJ), reflecting the dynamic nature of production in the basin.

"The variation of intensity from one well to the next underscores the myriad factors that can impact the GHG intensity of any one asset and that an overreliance on basin-wide averages can be extremely limiting," said Shane Whipple, Emissions Insight Analyst, Center of Emissions Excellence. "Utilizing S&P Global Commodity Insights' unique capabilities, we are able to provide a level of granularity to truly understand the nature of upstream oil and gas emissions for each individual asset."

About the analysis

The S&P Global Commodity Insight's estimate of Permian emissions includes carbon dioxide, nitrous oxide and methane emissions of upstream oil and gas operations. Coverage includes all drilling and completions (including natural gas and diesel combustion), operations, electricity imports and flaring and fugitives across the three main Permian plays: Wolfcamp Midland, Wolfcamp Delaware and Bone Springs. Midstream transportation emissions are not included.

Upstream emissions estimates make use of a complex, purpose-built bottom-up model built atop of S&P Global Commodity Insights extensive upstream database and coverage of all active wells in the Permian on a monthly basis over the entire time period presented in this study. This model is independent of U.S. Environmental Protection Agency reporting although is regularly compared against it and other public sources.

Beginning in 2022, S&P Global Commodity Insights estimates made use of methane observation data from [Insight M](#). These data greatly increased both the volume of methane emissions and the reliability of those estimates. Estimates prior to 2022 used sophisticated calculations and factors to estimate venting and fugitive methane emissions but were notably lower quality. More information on the methane observation data used from Insight M is available here:

<https://view.highspot.com/viewer/651121fb7c2bcb2c1c1b9fb0f6868d3f#1>

Coverage of upstream activity is comprehensive. In 2024, coverage included all 160,000 active wells and 12,000 new wells in the Wolfcamp Midland, Wolfcamp Delaware and Bone Springs—100% of producing wells. Methane observations from Insight M for the same period included 81.8% of the 160,000 active Permian wells, (78.5% of conventional wells and 88.6% of unconventional wells). These assets supplied 90.0% of the 3.9 billion boe produced in 2024.

Insight M overflights observation data provides a level of resolution that is up to 5 times greater than that of satellites, providing reliable attribution not only by facility, but in most cases to specific assets or pieces of equipment.

Threshold for detection isn't a factor for methane estimates prior to 2022 due to the methodology model estimates. Insight M methane observations since 2022, are as low as the range of 50-10 kg/hr depending on the specific overflight. These observed volumes account for more than 68% of total methane released to the atmosphere from upstream oil and gas operations. The volumes from all sources below this threshold were estimated using the Rutherford model developed by Stanford University and included in the totals used in the analysis. More information on the methodology employed by Insight M can be found here:

<https://view.highspot.com/viewer/992ecc322aa7c4d80d5f6b15a4a0f2c4#1>

Global Warming Potential Factor:

S&P Global Commodity Insights conversion of methane to CO₂ equivalency are based on a Global Warming Potential (GWP) factor for 100 years of 28 tons of CO₂ per ton of methane. Using the 20-year factor of 86 would thus increase both the emissions reduction and the continuing emissions to 3.07 times the figures cited in this report.

Media Contacts:

Jeff Marn +1-202-463-8213, Jeff.marn@spglobal.com

Americas: Kathleen Tanzy + 1 917-331-4607, kathleen.tanzy@spglobal.com

Asia: Melissa Tan + 65-6597-6241, melissa.tan@spglobal.com

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