

World's dirtiest oil and gas fields are in Russia, Turkmenistan and Texas

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Oil and natural gas fields in Russia, Turkmenistan and Texas are the most climate-damaging on Earth, according to a first-of-its kind analysis that looks at greenhouse-gas emissions across entire supply chains and

finds they vary widely. The dirtiest fields emit more than 10 times as much carbon dioxide equivalent as the least emissions-intensive sites, it finds.

Released Thursday by the nonprofit Rocky Mountain Institute, the Oil Climate Index plus Gas (OCI+) web tool ranks 135 global oil- and gas-producing resources—which together account for half of the world's supplies of those commodities—based on a full life-cycle analysis of their 2020 emissions. Russia's Astrakhanskoye natural gas field has the biggest footprint across its supply chain because of prolific leaks on pipelines and other infrastructure "downstream," according to the analysis. Turkmenistan's South Caspian basin and the Permian Basin in West Texas rank second and third; the majority of their emissions arise "upstream," during production.

Created by researchers at RMI, Stanford University, the University of Calgary and Koomey Analytics, the OCI+ tool and an accompanying report conclude that significant fossil-fuel emissions occur not just at the point of combustion, but directly at the wellhead and during processing, refining, and transportation. RMI estimates that the U.S. Environmental Protection Agency's greenhouse gas reporting program undercounts oil and gas industry emissions by a factor of two. The project received funding from the philanthropic organization of Michael Bloomberg, the founder and majority owner of Bloomberg LP, which owns Bloomberg News.

Methane, a [greenhouse gas](#) that is the primary component of natural gas and a powerful global-warming agent, accounts for more than half of operational emissions at sites worldwide. Curbing the flaring and venting of the gas and ensuring that oil-field equipment is working properly can help significantly reduce upstream emissions, the report says, calling methane reductions "the highest priority for the oil and gas sector."

The initiative draws on years of research by academics and nonprofit institutions, public data and satellite images. It boils down to the questions, "Who has the worst barrel, and who are the suckers buying the bad stuff?" said Deborah Gordon, senior principal of climate intelligence at RMI, the research lead. That's where the spotlight needs to be to combat climate change, she said.

Oil and gas prices have surged after demand rebounded from the COVID-19 pandemic and due to dislocations caused by Russia's war on Ukraine. Despite growth in renewable power generation, global reliance on [fossil fuels](#) is poised to grow before tapering amid a transition to alternatives like wind and solar. Yet the urgency to cut emissions has grown. A United Nations-backed panel of scientists recently warned that emissions must be significantly reduced by 2030 to help avoid the catastrophic impacts that would result from warming exceeding the Paris Agreement targets of 1.5° and 2° Celsius.

The report recommends buying fuel locally as much as possible to save on transport-related emissions, but according to the OCI+ analysis, Europe might actually avoid some emissions by buying gas from the U.S. that is super-chilled into liquid and shipped across the ocean rather than from Russia. Sourcing gas from Russia is "horrid" because of leaks, Gordon said: On the OCI+ digital emissions map, Russia's pipeline system jumps out in bright yellow and orange due to concentrated methane emissions. (New York City and Boston, which have aging pipe infrastructure, show up as smaller, less intense hot spots, while Russia's liquefied natural gas export terminal in Siberia is a blip.)

For decades, policies have targeted reducing emissions from cars and power plants, which puts the responsibility on the consumer with little transparency on emissions from producers themselves, Gordon said. "Conventional wisdom is that the consumer is responsible for 86% of the emissions from the barrel." But the research shows that's not the case for

the most polluting oil and gas fields, she said.

The researchers also estimated a price for carbon, and OCI+ shows how accounting for life-cycle emissions would tack on more than \$50 per barrel for the highest-emitting sites. If a fee reflecting the [social cost](#) to carbon were imposed today, the production-weighted average cost for the 135 fields would be \$7 per barrel of oil equivalent, less than \$1 for refiners and \$4 for shippers, according to the analysis. The values are based on a cost of \$56 per metric ton that was modeled by the U.S. government. (Carbon fees can be adjusted in OCI+ to account for different scenarios.)

Aging oil and gas fields become more GHG-intensive as more energy and water are needed to extract the fuel from underground. The average emissions of a typical large oil field will double over 25 years, according to past research. Two prime candidates for decommissioning are the Minas field in Indonesia and Wilmington in California, since they already require large injections, Gordon said.

The [web tool](#) also breaks out the share of sites' emissions from flaring, or burning off excess natural gas. This practice is notoriously common in the Permian Basin, where oil is the most profitable fuel and natural gas is a nuisance byproduct.

"The Permian looks terrible," Gordon said, but "if Texas cleans up its act and really focuses on not leaking methane and not flaring its gas, it will be there right at the top" of the lowest-emitting areas."

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