

# Researchers see drop in methane emissions from natural gas local distribution systems

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Landfill burn off flare. Credit: Eddie Hagler/Public Domain

A team led by Washington State University researchers has found that methane emissions from local natural gas distribution systems in cities and towns throughout the U.S. have decreased in the past 20 years with significant variation by region.

The researchers found that upgrades in metering and regulating stations, changes in pipeline materials, better instruments for detecting pipeline leaks as well as regulatory changes have led to methane [emissions](#) that are from 36% to 70% lower than current Environmental Protection Agency estimates when the data gathered for this study is combined with current pipeline miles and the numbers of facilities. The study also showed significant variations by region, with some areas showing higher than average emissions because of large differences in the age and type of pipe in different parts of the US.

The study, published online today in *Environmental Science & Technology*, provides the most comprehensive set yet of direct measurements of emissions from the distribution system and, with a series of partner studies, is helping to determine the [natural gas](#) industry's contribution to U.S. [greenhouse gas emissions](#) and to global warming. The distribution system includes underground natural gas pipelines as well as metering and regulating facilities and customer meters in cities and towns. The research is led by Regents Professor Brian Lamb in WSU's Laboratory for Atmospheric Research with assistance from Conestoga-Rovers and Associates, an engineering and environmental consulting firm.

The researchers found dramatically lower emissions at metering and regulating stations. In fact, because of the significant differences they saw from the early 1990's data, the researchers revisited nine sites from the previous study and measured 10 times fewer emissions than 20 years ago. They also measured lower emissions from individual pipeline leaks as compared to earlier studies. The improvements are the result of both regulatory changes and increased investment in leak prevention by utilities.

When the new emissions data were combined with current pipeline mileage information, significant regional variations were observed, with

the Eastern region of the United States accounting for more than a third of the total U.S. emissions from pipeline leaks, and the larger western region, where systems tend to be newer, contributing 17 percent of total emissions.

Natural gas, which is mostly methane, produces less carbon dioxide than oil or coal. But when unburned methane is released into the atmosphere, it is a potent greenhouse gas with a warming potential 28 to 34 times greater than carbon dioxide over a 100-year timeframe (and up to 84 times more potent over a 20 year timeframe). Depending on how much is emitted from the natural gas supply chain, methane could offset the benefit of using natural gas to reduce carbon dioxide emissions.

As part of the study, the research team carefully selected numerous sites in various regions around the country that met specific criteria to ensure a comprehensive and representative dataset. The researchers took direct emissions measurements of 230 randomly selected, representative leaks from underground pipelines as well as at 229 metering and regulating stations where natural gas is measured and regulated from higher pressure pipelines to lower pressure distribution pipelines.

The researchers estimate that methane emissions from the distribution system range from approximately 393 to 854 gigagrams per year, which is between 0.1 and 0.2 percent of the methane delivered nationwide. This is equivalent to the annual greenhouse gas emissions of about seven million vehicles. The higher EPA estimates of 1329 gigagrams are based largely on previous measurements from a national study in the early 1990s in which Lamb and his colleagues also participated.

Lamb's methane emissions project is part of a group of ongoing studies that are looking at the entire natural gas supply chain, from the production wells to the transmission pipeline system to local distribution systems. EPA inventory data suggests that emissions from local

distribution systems are thought to make up approximately 20 percent of the total from the entire natural gas supply chain. The study was done in coordination with major natural gas utilities and the Environmental Defense Fund (EDF) and was sponsored by the American Gas Association, Con Edison, EDF, National Grid, Pacific Gas & Electric, and Southern California Gas.

Lamb was surprised by the findings, even as distribution system pipeline mileage has increased approximately 44 percent since the 1990s. Lamb attributes the decreased emissions at metering facilities to large changes in equipment and better inspection and maintenance.

In recent years, new Environmental Protection Agency (EPA) rules have required gas companies to measure and report their [greenhouse gas](#) emissions. In addition, many states have adopted requirements and policies for utilities to replace older leakier pipes with plastic and protected steel pipes.

The group also used different methods than in the previous study, which Lamb believes results in a more accurate assessment of the actual emissions. In the 1990s study, researchers measured pipeline leaks by digging down to a pipeline, isolating a leaking section, measuring the emissions, and then subtracting the [methane emissions](#) that would have been lost in the soil via soil oxidation. Lamb's group directly measured known pipeline leaks on the surface, getting a better indication of exactly how much is being leaked to the atmosphere.

The researchers also made twice as many measurements as in the previous study and carefully checked their results with independent methods.

**More information:** *Environmental Science & Technology*,  
[pubs.acs.org/doi/abs/10.1021/es505116p](https://pubs.acs.org/doi/abs/10.1021/es505116p)

Provided by Washington State University

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