

# Researchers calculated the UK's greenhouse gas emissions from people exhaling: Here's what they found

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The UK population collectively breathes out about 1,100 tons of the greenhouse gases methane and nitrous oxide every year. That's one key

finding from our [new research](#) published in *PLOS ONE*.

Those breath emissions are a mere 0.05% and 0.1% of the UK's total human-generated emissions of the two gases respectively. Their overall contribution to the country's collective carbon footprint of course pales in comparison to fossil fuel burning and other major sources of emissions.

If you're looking to reduce your climate impact, don't hold your breath.

Yet an exercise like this is still very useful for atmospheric scientists like us. The research was lead by Ben Dawson, who was an MSc student at the University of Edinburgh at the time. We were Ben's supervisors and we helped him turn his master's project into a full academic study.

The project appealed to us because, while we know about most [greenhouse gas emissions](#) that are a result of human activities, we also know we are missing many small emission sources that are required to complete our understanding of global processes.

Even if these contributions are very small, dozens of these diffuse sources can add up to a significant omission from greenhouse gas estimates at the national or global scale, which ultimately lead to higher uncertainties in models that predict the future impacts of climate change.

Carbon dioxide is the most important greenhouse gas but it's not relevant to this research since the CO<sub>2</sub> in human breath is essentially "[carbon neutral](#)." As part of the respiration process, we consume fuels like sugars and fats, converting them into water and the [carbon dioxide](#) we then breathe out.

This aligns with photosynthesis, where plants convert sunlight and CO<sub>2</sub> into the food we eat. Carbon in and carbon out are balanced, so our

exhalation contributes no more to climate change than we mitigate through growing crops.

However, the story takes a turn when we consider other less common but more potent greenhouse gases, notably [nitrous oxide](#) and methane (which alone is responsible for about a third of global warming). Both are produced by microbes within our digestive system and so any we breathe out results in a net increase in the amount in the atmosphere.

The same process happens on a much larger scale in livestock like cows and sheep. In fact, around [15% to 20%](#) of the methane emitted by human activities is produced in the guts of these animals, and is released when they breathe out or break wind.

Although humans release these gases too, albeit to a lesser extent, it's a topic that has received scant attention from scientists before now—perhaps because the question of "what can we do about it?" looms large.

## **Why some breathe methane and others don't**

This is why our student Ben conducted his study, which involved assessing the methane and nitrous oxide emissions from the breath of over 100 volunteers. Each volunteer was asked to breathe into an inert plastic bag, from which Ben was able to extract a sample of breath for analysis.

Ben found that only 31% of participants exhaled methane, but all emitted small and variable quantities of nitrous oxide.

The investigation delved into various factors, including diet and participant demographics, to why some people breathe out more greenhouse gases than others.

Volunteers were categorized as meat-eaters, flexitarians or vegetarians, to test the hypothesis that a shift from a carnivorous to a plant-rich (and more cow-like) diet might increase methane emissions.

Contrary to expectations, the study revealed no correlation between diet and emissions for either gas, suggesting that transitioning to a plant-based diet does not significantly elevate methane emissions from human breath.

The study corroborated [previous findings](#) indicating that people under 30 years old were less likely to be methane exhalers (25%) compared to those above 30 (40%). Additionally, men were slightly less likely to exhale methane (25%) than women (38%).

However, with a limited population size from which to sample from, more research would be required to prove if this was consistent across the entire population, or just the volunteers in this study.

Other factors like exercise routines, alcohol intake and general gut health are all likely to contribute to the variation in methane exhalation, but they were beyond the scope of this study.

Using [demographic data](#), we were able to estimate that the UK population (68.2 million) releases a total of 1,040 tons of methane and 70 tons of nitrous oxide through breathing each year. That's about 15 grams of [methane](#) per person per year.

The impact of both gases combined works out to a total of 53,900 tons of "carbon dioxide equivalent," the metric used for most greenhouse gases, which isn't much compared to the UK's overall emissions of [417 million tons a year](#).

If you want to be responsible for releasing less [greenhouse](#) gases into the

atmosphere, you'd be better off breathing as normal and focusing on other more manageable activities.

**More information:** Ben Dawson et al, Measurements of methane and nitrous oxide in human breath and the development of UK scale emissions, *PLOS ONE* (2023). [DOI: 10.1371/journal.pone.0295157](https://doi.org/10.1371/journal.pone.0295157)

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