

Nitrous oxide: Why the environment isn't amused about laughing gas

April 20 2023, by Mark Lorch



Credit: AI-generated image ([disclaimer](#))

A young man breathes deeply from a gas-filled bag. He begins to feel a pleasurable sensation "particularly in the chest and extremities" before dancing around and then collapsing in a heap. A few minutes later he comes to and is consumed by a fit of giggles. The young man is a chemist, living in Bristol and his [name is Humphry Davy](#). The year is

1799 and Davy has just discovered the euphoric effects of nitrous oxide (N_2O), which he names "laughing gas."

Word soon spread through high society and [laughing gas parties](#) became all the rage. But, despite its pain relief properties, it wasn't adopted in medical settings until the middle of the 19th century.

Now the UK government is considering outlawing possession of the gas over concerns about health risks [when used as a recreational drug](#). But it is overlooking another threat it poses to humanity: it is a powerful greenhouse gas.

N_2O is one of the most popular recreational drugs among 16- to 24-year-olds but [heavy use can cause spine damage](#).

The UK government has made it clear its intention to make possession of the gas a criminal offense. Meanwhile others, including former government drug advisor David Nutt, see criminalization as [an overreaction](#). The gas is now used in [rocket fuel](#), as a aerosol propellant—particularly for whipped cream—as well anesthetic gas and air. So banning private possession won't do enough to tackle the damage it is doing to our planet.

Like [carbon dioxide](#) (CO_2), N_2O can [absorb infrared radiation from the Sun](#), but its structure allows it to do so much more efficiently. Its potency as a greenhouse gas is about [300 times that of carbon dioxide](#). So the cans of whipped cream and the small canisters containing the gas, (known as whippits to recreational users) have a [surprising "carbon footprint"](#). Each can or canister contains just eight grams of N_2O . But when released into the atmosphere this has the equivalent effect of 2.4 kilograms of CO_2 , which is about the amount emitted from driving an SUV for ten miles.

No laughing matter

The concentration of N₂O [in the atmosphere is very low](#), (335 parts per billion) about a thousand times lower than CO₂. But, like CO₂, N₂O levels are on the rise. Concentrations are about 20% higher than during Humphry Davy's time.

Despite these [low concentrations](#), N₂O's potency means it still has a significant effect on the climate. [It is the third most damaging greenhouse gas](#) and is responsible for about 6% of the warming we are observing today ([methane is the second, accounting for 10%](#)).

Unfortunately N₂O's impact doesn't stop there. [N₂O is now the main threat to the ozone layer](#) since CFC chemicals were banned in the 1980s. Once N₂O is released at ground level it takes about 100 years to migrate to the stratosphere (the second layer of Earth's atmosphere) where UV light catalysis its conversion to nitric oxide (NO). This then reacts with ozone (O₃), forming another pollutant—[nitrogen dioxide](#) (NO₂), and molecular oxygen (O₂)—which already makes up 21% of the atmosphere.

Whippits are a relatively minor source of human emissions of nitrous oxide, the vast majority (some 70%) [comes from agriculture](#). [Nitrogen-based fertilizers](#), critical for farming, break down into a variety of nitrogen compounds, including N₂O. Other sources include the burning of fossil and biomass fuels, emissions from industry (particularly in the [manufacturing of nylon](#)), and release while being used as an [anesthetic in clinical settings](#).

The solution

Many of these N₂O emissions can be tackled through simple changes of

behavior. Applying more sparing amounts of fertilizers at the right part of the growing season means more fertilizers being taken up by plants. As a result less fertilizer is left in the soil where it runs off into water ways and breaks down into N_2O .

Meanwhile, in [clinical settings](#), huge amounts of N_2O are released through leaky valves, expired stock and [theft for recreational use](#). Some parts of the NHS are already putting systems in place to [tackle many of these issues](#) through upgrading gas manifolds, security and stock control.

N_2O is one of the gases targeted for reductions in [international agreements](#), such as the [Kyoto Protocol](#) and [Paris agreement](#), so its reduction does form part of government targets to reduce emissions of warming gases. And there are alternatives to N_2O for clinical and medical use as well as in food industries.

Anesthetists can choose from many other anesthetics and analgesics, the nylon industry is moving away from processes that release the gas. And if you are tempted by strawberries and cream, use some elbow grease to whip up a bowl instead of turning to the aerosol can.

This article is republished from [The Conversation](#) under a Creative Commons license. Read the [original article](#).

Provided by The Conversation

Citation: Nitrous oxide: Why the environment isn't amused about laughing gas (2023, April 20) retrieved 23 June 2024 from <https://phys.org/news/2023-04-nitrous-oxide-environment-isnt-gas.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.