# Rising nitrous oxide emissions jeopardize climate goals

**Nitrous oxide ($N_2O$) is a greenhouse gas 300 times more potent than carbon dioxide and remains in the atmosphere for more than 100 years. A growing use of nitrogen fertilizers in food production is increasing concentrations of $N_2O$ in the atmosphere – if left unabated it will require far larger reductions in $CO_2$ emissions than otherwise in order to be on track for limiting global warming to less than 2°C above pre-industrial levels.**

This is one of the many results from a new study (link) led by Professor Hanqin Tian, Director of the International Center for Climate and Global Change Research at Auburn University in Alabama USA, published today in Nature.

## Atmospheric growth in $N_2O$ is accelerating

Professor Tian led an international consortium of scientists from 48 research institutions in 14 countries under the umbrella of the Global Carbon Project and the International Nitrogen Initiative. The goal of the effort was to produce the most comprehensive assessment to date of all sources and sinks of the potent greenhouse gas, nitrous oxide ($N_2O$).

The breakthrough study points to an alarming trend affecting climate change: "$N_2O$ concentrations in the atmosphere have been stable for thousands of years, but the $N_2O$ concentration has risen dramatically over the past few decades and its growth has accelerated over the last 10 years due to emissions from various human activities", said senior scientist Dr. Rona Thompson, from NILU – Norwegian Institute for Air Research, and one of the key authors of the study.

"The dominant driver of the increase in atmospheric $N_2O$ comes from agriculture," Tian said, "and the currently growing demand for food and, in particular meat, will just further increase global $N_2O$ emissions. There is a conflict between the way we are feeding people and stabilizing the climate."

## Not compatible with the Paris accord

The most pertinent result of the study, coauthors agree, was to find that current trends in $N_2O$ emissions are not compatible with pathways consistent to achieve the climate goals of the Paris accord.

"Current emissions are tracking global temperature increases above 3°C, twice the temperature target of the Paris accord," Robert Jackson said. Jackson is a Professor and coauthor from Stanford University in California USA, and chair of the Global Carbon Project.

"One of the $N_2O$ challenges lies in the fact that on a global scale, we are not using nitrogen-based fertilizers efficiently. At the same time, this gives us a large opportunity for reducing $N_2O$ emissions", says Dr. Rona Thompson.

"This is especially true for regions where excess nitrogen is being used with no benefit in terms of crop yield, for instance in East Asia. Reducing the excess use of nitrogen fertilizers in these regions will have big pay-off in terms of reducing $N_2O$ emissions as well as improving air, soil and water quality."

As of now, Europe is the only region in the world that has successfully reduced $N_2O$ emissions over the past two decades. This is due to policies aimed at reducing greenhouse gas emissions and air pollution from industry, as well as from agriculture by improving nitrogen fertilizer use efficiency.

In the study, the largest contributors to the growth in global $N_2O$ emissions were found to come from East Asia, South Asia, and South America. In these regions, nitrogen fertilizer use was the dominant factor driving the emissions. Generally, the highest growth rates in emissions are found in emerging economies, particularly Brazil, China and India, where crop production and livestock numbers have both increased.

“This study shows that we now have a comprehensive understanding of the $N_2O$ budget, including climate impacts”, Thompson concludes. “As scientists we are able to assess and quantify measures to reduce $N_2O$ emissions, and many of these measures will also improve water and air quality benefiting both human health and ecosystems. This allows us to appropriately inform environmental policies.”

*The study, “A comprehensive quantification of global $N_2O$ sources and sinks,” (link) was published (8 October) in the journal Nature.*