

# STUDY POINTS TO NITROUS OXIDE EMISSIONS DERAILING PARIS CLIMATE ACCORD TEMPERATURE TARGET

Relevant for: Environment | Topic: Environmental Degradation - GHGs, Ozone Depletion and Climate Change

A farmer spreading fertilizer at a paddy field. Representational image | Photo Credit: [B. VELANKANNI RAJ](#)

Rising nitrous oxide emissions may negate current global attempts to keep temperatures from rising 1.5 degrees Celsius by the turn of the century, and agriculture practices in India, Brazil, China and the United States play a significant role in this, says a study that appeared in the journal *Nature* on Wednesday.

“Current emissions are tracking global temperature increases above 3 degrees Celsius, twice the temperature target of the Paris accord,” said Robert Jackson, Professor and a co-author from Stanford University and chair of the Global Carbon Project.

The growing use of nitrogen fertilizers in the production of food worldwide is increasing concentrations of nitrous oxide in the atmosphere — a greenhouse gas 300 times more potent than carbon dioxide — which remains in the atmosphere longer than a human lifetime.

Nitrous oxide has risen 20% — from 220 parts per billion (ppb) in the pre-industrial era to 331 ppb in 2018 — and its growth has accelerated over recent decades due to emissions from various human activities.

“The atmospheric N<sub>2</sub>O burden increased from 1.4 billion ton in the 1980s to 1.5 billion ton in 2007-2016, with a possible uncertainty of ±20 million tons. Our results show a substantial increase in global N<sub>2</sub>O emissions that is primarily driven by anthropogenic sources, as natural sources remained relatively steady throughout the study period,” says the research paper.

Emissions from synthetic fertilizer dominates releases in China, India and the U.S., while emissions from the application of livestock manure as fertilizer dominates releases in Africa and South America, the study found. “The highest growth rates in emissions are found in emerging economies, particularly Brazil, China and India, where crop production and livestock numbers have increased,” said an accompanying press statement.

The failure to include N<sub>2</sub>O within climate mitigation strategies will need even greater abatement of CO<sub>2</sub> and methane (also a greenhouse gas). Although N<sub>2</sub>O mitigation is difficult because nitrogen is the key limiting nutrient in agricultural production, this study demonstrates that effective mitigation actions have reduced emissions in some regions — such as Europe — through technological improvements in industry and improved efficiency of nitrogen use in agriculture.

The significant increase in nitrous oxide was being driven by China, and it was only Europe, as a region, that had successfully tapered emissions, said Dean, School of Biotechnology, Indraprastha University, and chairman of the Indian Nitrogen Assessment (INA) initiative. “India has managed to slow nitrogen emissions growth since 2015 in part due to the *neem*-coating of urea policy that reduced atmospheric loss of the element as well as soil contamination. “However, more needs to be done and there are lessons from Europe on how to go about this,” he told *The Hindu*.

Though agriculture remains the largest contributor to nitrogen emissions, non-agricultural emissions of nitrogen oxides and nitrous oxide were also growing rapidly, with sewage and fossil-fuel burning — for power, transport and industry — leading the trend. Indian Nox (nitrous oxides) emissions grew at 52% from 1991 to 2001 and 69% from 2001 to 2011, the INA had reported in 2018.

Agricultural soils contributed to over 70% of N<sub>2</sub>O emissions from India in 2010, followed by waste water (12%), and residential and commercial activities (6%). Since 2002, N<sub>2</sub>O has replaced methane as the second largest greenhouse gas from Indian agriculture.

Chemical fertilizers (over 82% of it is urea) account for over 77% of all agricultural N<sub>2</sub>O emissions in India, while manure, compost and so on make up the rest. Most of the fertilizers consumed (over 70%) go into the production of cereals, especially rice and wheat, which account for the bulk of N<sub>2</sub>O emissions from India.

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