Drastic changes needed to curb N2O, most potent greenhouse gas: study

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Meat consumption in the developed world needs to be cut by 50 per cent per person by 2050 if we are to meet the most aggressive strategy, set out by the Intergovernmental Panel on Climate Change (IPCC), to reduce one of the most important greenhouse gases, nitrous oxide (N_2O).

This is the finding from a new study, published today, 13 April, in IOP Publishing's Environmental Research Letters, which also claims that N_2O emissions from the industrial and agricultural sectors will also need to be cut by 50 per cent if targets are to be met.

The findings have been made by Dr Eric A Davidson of The Woods Hole Research Center, Massachusetts, and demonstrate the magnitude of changes needed to stabilise atmospheric N_2O concentrations as well as improve the diets of the growing human population.

N_2O is the third highest contributor to climate change behind carbon dioxide (CO_2) and methane (CH_4); however, it poses a greater challenge to mitigate as nitrogen is an essential element for food production.

It is also the most potent of these three greenhouse gases as it is a much better absorber of infrared radiation; however, the total anthropogenic emissions are about 6 million metric tons of nitrogen as N_2O compared to 10 billion metric tons of carbon as CO2.

The main sources of N_2O are from the spreading of synthetic nitrogen fertilizers onto agricultural soils and storage and use of livestock manure.

The nitrogen contained in fertilizers and manure is broken down by microbes that live in the soil and released into the atmosphere as N_2O.

Dr Davidson believes that N_2O emissions can be reduced through better management of fertilizer and manure sources, as well as reducing the developed world's per capita meat consumption to relieve pressure on fertilizer demand and reduce growth in the amount of manure being produced.

In a draft of the IPCC's fifth assessment report, four scenarios have been adopted, known as representative concentration pathways (RCPs), which represent possible pathways of reductions for a number of greenhouse gases. Dr Davidson evaluated the scale of changes needed to meet the predicted N_2O pathways.

Three of the IPCC's less aggressive scenarios could be met by reducing meat consumption, improving agricultural practices or reducing emissions from industry. The most aggressive scenario, where N_2O concentrations stabilise by 2050, can only be met if a 50 per cent reduction, or improvement, for each of the above is achieved.

To make these calculations, Dr Davidson relied on data provided by the Food and Agricultural Organisation, which assumes that the global population will increase to 8.9 billion by 2050 and the daily calorific intake per capita will increase to 3130 kcal.

They also assume that the average meat consumption of each person in the developed world will rise from 78 kg per year in 2002 to 89 kg per year in 2030 and from 28 kg per year in 2002 to 37 kg per year for each person in the developing world.

Assessing the likelihood of reducing meat consumption in the developed world by 50 per cent, Dr Davidson said: "If you had asked me 30 years

ago if smoking would be banned in bars I would have laughed and said that would be impossible in my lifetime, and yet it has come true.

"Are similar changes possible for diet? That will depend not only on education about diet, but also upon prices of meat. Some agricultural economists think that the price of meat is going to go way up, so that per capita consumption will go down, but those are highly uncertain projections."

More information: Representative concentration pathways and mitigation scenarios for nitrous oxide, Eric A Davidson 2012 *Environ. Res. Lett.* 7 024005. iopscience.iop.org/1748-9326/7/2/024005/article

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