N_2O

net 350

NITROUS OXIDE

V1.0

WHAT IS THIS GAS?

Origins	Nitrous oxide (N_2O) is both naturally and anthropogenically sourced. Naturally, N_2O predominantly comes from the breakdown of nitrogen in the ocean and in soils. More frequently, N_2O is found via anthropogenic sources such as fertilized fields, fossil fuel combustion, and sewage. Agriculture is the most impactful sector as it accounts for 74% of nitrous oxide emissions.
What is the current PPM of this gas? And the atmospheric trend since 1700 and since 1960?	In 2020 there was approximately (330 PPB) 0.33 PPM of atmospheric N_2O. In 1986, there was approximately 0.30 PPM of atmospheric N_2O. In the mid-1700s (1750), atmospheric N_2O was approximately 0.27 PPM.
Why is this gas important to climate change? How long does it remain in the atmosphere?	Nitrous oxide is particularly detrimental to stratospheric ozone because it reacts with other chemicals and depletes it. N_2O also mixes with ozone in the troposphere which contributes to the creation of smog. Smog, as a result of N_2O reacting with other chemicals, has been proven to cause lung-related illnesses and complications. Nitrous oxide has a lifespan of around 115 years, meaning it stays in the atmosphere for a considerable amount of time. N_2O's GWP is 273 times that of carbon dioxide over a 100-year time span.
What is an appropriate PPM goal to meet 1.5 degree threshold?	Information regarding PPM goals of atmospheric N_2O is limited. On a much smaller (and less global) scale, long term exposure should exceed no more than 0.02 PPM. This does not equate to the global emissions goal, rather it is an individual-scale limitation set in place by the National Institute for Occupational Safety and Health.

REDUCTION POTENTIAL

Can emissions be reduced?	Given that most N_2O emissions are anthropogenic, it is indicative that emissions can be reduced. 74% of N_2O comes from agriculture, so the shift in certain agricultural practices such as using different soils and improving manure management are good places to start to reduce emissions.
Can emissions be captured at source?	Emissions can be captured at point source. Nitrous oxide is most commonly captured at places like industrial facilities as it is an easy location to access emissions.
Can this gas be removed from the atmosphere or ocean?	Removing N_2O from the atmosphere is possible, and more likely than removing emissions from the ocean. A Beijing-based gas company, Linggas, has begun capturing N_2O emissions directly from the source: an adipic acid facility.

TECHNOLOGY REMAINS IN DEVELOPMENTAL STAGES

What are current and potential removal technologies?	Linggas has discovered a way to capture N_2O emissions directly from the adipic acid facility. Captured N_2O is then purified and sold for other companies to use in the manufacturing of LCD screens and flat panel displays. Linggas was established in 2001 and works to provide gas products (among other non-gas related services) to the industry. Linggas has created and executed this practice, yet it is not a widely functioning method.
Which of these technologies are potentially scalable?	The capture and "recycling" as practiced by Linggas removes N_2O and uses it in other products. An issue with this idea is the supply and demand for nitrous oxide. Linggas' technology could support up to 20,000 tons of N_2O per year, but the demand for this volume of gas is not as high as the supply that could potentially be provided. In theory, this is a good start to the removal of atmospheric N_2O, but it is not yet scalable due to the supply and demand issues. Other technologies intended to increase removal are not as common as technologies for methane and CO_2 removal. In terms of scalability, it is likely that emission reduction as opposed to removal is more practical.

FOR EACH TECHNOLOGY:

What are the uses of the removed gas?	Because there is not a wide variety of N_2O removal technologies, there is not a wide variety of uses. Linggas, the Beijing-based company in China proposed the ability to recycle N_2O so it can be utilized in the manufacture of LCD screens and even photovoltaic solar panels. Aside from that, there are not many uses for removed gas since removal technologies are limited.
If the use is sequestration, what is the sequestration time frame?	Sequestration is not a common use of captured nitrous oxide.
What is the net energy requirement to process removal?	Because technologies for removal are limited or still in the process of development, general net energy requirements are not well understood.

V1.0