Methane Oxidation is Critical for Our Children's Future

Methane is a potent greenhouse gas that causes about one third of today's global warming. It is, however, short-lived since natural processes continually oxidize it in the atmosphere. Using Enhanced Atmospheric Methane Oxidation (EAMO), we can accelerate these processes and, at low cost, reduce atmospheric methane to pre-industrial concentrations. Doubling the background rate of methane oxidation could rewind warming back to 2002 levels by 2050. In addition, EAMO could protect humanity in the event that methane emission from melting permafrost reaches catastrophic levels.

As CO_2 removal begins to scale up on our path to climate restoration, the threat of a methane burst from melting permafrost is becoming clearer and urgent. Warming has melted 85% of Arctic sea-ice, with complete summertime ice loss expected around 2050. The last time Earth heated rapidly and lost its polar sea-ice, a massive methane burst from melting permafrost led to the extinction of 30% of all species. We must commit to protecting our children from such a disaster.

Methane bubbling up from thawing, underwater permafrost

Doubling the natural rate of methane oxidation could cut methane levels in half by 2030. This methane removal would cool our planet significantly, and safeguard our children from a catastrophic methane burst.

Today, public attention is focused on reducing methane emissions and leaks. Emissions come from wetlands, wildfires, landfills, livestock, rice fields, coal mines and oil production–sources that cover much of Earth's land mass. Since nearly half derive from natural sources, it appears infeasible to reduce methane emissions and thus levels by more than a few percent.
EAMO, however, could reduce levels by 50% and protect against a methane burst.

Nature does remove methane continuously, oxidizing it into water and CO_2. Oxidation reduces GHG warming impact of methane by 98%, since CO_2 is a far weaker warming agent than methane. EAMO enhances one of nature's chemical pathways, so we can double or even triple the rate of methane oxidation.

Iron chloride forms naturally when iron-rich dust contacts sea-salt spray; in the presence of sunlight, this chemical oxidizes methane. EAMO accelerates the process by distributing a fine, short-lived iron chloride mist over the ocean in sunny regions. This can be done by adding iron chloride to ship exhaust. As to safety: iron chloride is commonly used to treat municipal water.

Next Steps for 2023

- Optimize the chemistry
- Develop software to measure methane removal using existing satellite data
- The Climate Restoration Safety and Governance Board (CRSGB) reviews applications for projects
- Secure advance purchases of methane removal offsets

Methane removal Is financially viable

Full-scale methane removal is expected to cost roughly $1 billion per year. It is expected to roll back warming to 2002 levels, thus reducing climate-related emergency relief and insurance claims by $50 to $100 billion per year. EAMO can be funded through:

- Government support, to save many tens of billions in annual emergency relief by reducing warming to 2002 levels
- Insurance company funding, since EAMO could save $40 billion per year in claims
- Carbon offsets: full-scale operation could produce 7 billion carbon offsets per year.

What policies and actions are needed from governments and NGOs?

1. Explicitly endorse the goal of climate restoration
2. Support the Climate Restoration Safety and Governance Board
3. Fund development of computing and reporting of satellite data that measures greenhouse-gas removal
4. Fund chemistry optimization of methane oxidation, and publication of results
5. Develop rules for government and insurance company funding for methane oxidation.

Benefits of methane restoration

- Restoring pre-industrial methane levels. will reduce global warming to 2002 conditions.
- Methane restoration will ensure against extinctions in case today's methane burst from permafrost melt becomes severe. The last time the Arctic ice melted, 56 million years ago, about 1/3 of species went extinct from rapid global warming.

Side effects

- Preliminary environmental analysis shows no negative side-effects, and none are currently expected.
- Iron that settles into the ocean would slightly promote growth of phytoplankton–the base of the food web–thus improving ocean health as well as removing atmospheric CO_2

Climate Restoration: Reclaiming a Pre-Industrial Climate by 2050

Everyone wants to give our children a safe and healthy climate, one that humans have actually survived and thrived in long-term, with CO_2 levels below 300 ppm and methane below 1 ppm. That is the goal of climate restoration.

Climate restoration will require pulling a trillion tons of legacy CO_2 from the atmosphere by 2050 and cutting methane levels in half by 2030. Nature removes CO_2 primarily by photosynthesis in the ocean; forms limestone from the calcium carbonate shells of sea animals; and oxidizes methane above the ocean. We can copy nature and do the same, far more rapidly.

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