



SIERRA CLUB

MAINE CHAPTER

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To: Committee on Environment and Natural Resources
From: John Fitzgerald, Esq., Sierra Club Maine
Date: March 10, 2025
Re: In Opposition to L.D. 499 and L.D. 825: Two Acts to Prevent Geoengineering.

Dear Senator Tepler, Representative Doudera and members of the Committee:

My name is John Fitzgerald, and I am submitting the following testimony on behalf of Sierra Club Maine, representing over 22,000 supporters and members statewide. Founded in 1892, Sierra Club is one of our nation's oldest and largest environmental organizations. We work diligently to amplify the power of our 3.8 million members nationwide as we work towards combating climate change and promoting a just and sustainable economy. To that end, we urge the Committee to oppose L.D. 499 and L.D. 825, as written. If anything, we propose changing it substantially to a bill that directs the relevant agencies to study and address the issues raised in L.D. 499 and L.D. 825 and in our testimony below.

Summary: We recommend that the Committee ask the agencies and institutions with jurisdiction over or expertise in technology innovation, climate change, and natural resource restoration to study the issues raised in these two bills, including but not limited to methods of removing greenhouse gasses from both near the sources and from the ambient atmosphere, focusing on the scientific literature and climate intervention programs underway as of 2024 in the U.S. and around the world, and report back to the legislature within 6 months of the date of enactment with recommendations as to how to assess, develop and govern climate interventions, old, new and proposed. Within 9 months of the date of enactment the DEP and Department of Marine Resources should be directed to propose for public comment and adoption joint regulations governing the testing, assessment and deployment of safe nature – based greenhouse gas removal and other climate interventions and promulgate such regulations no less than 15 months after the date of enactment.

Analysis and Recommendations

We all need to be careful and avoid overly broad and unhelpful terms such as “Geoengineering”.

Our current geoengineering policy outlines Sierra Club's distinction- [See here](#). From page 94:

"Geoengineering for the purposes of this policy refers to technological interventions in the global commons to reduce global warming. Included in this policy are Solar Radiation Management (SRM) and Large Scale Albedo Enhancement. Some literature treats all carbon dioxide removal (CDR) approaches as geoengineering. In this policy we categorize CDR separately from geoengineering. Geoengineering does not directly reduce atmospheric CO2 concentrations, so it does not solve the underlying problem; it merely masks the impacts of high atmospheric



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greenhouse gas (GHG) levels temporarily and must be continually deployed in perpetuity, a costly and uncertain gamble."

L.D. 499 defines geoengineering as: "Geoengineering" includes, but is not limited to, carbon dioxide management, solar radiation management, stratospheric aerosol injection and weather modification techniques." Carbon dioxide management is far too broad to address the more specific issues with geoengineering.

The use of fossil fuels combined with some avoidable agricultural practices has dangerously geoengineered our climate and continues to do so. One of these bills, L.D. 825, as written could make the use of fossil fuels illegal which the following passage implies:

B. "Geoengineering" means any intentional, large-scale intervention in Earth's natural systems, including, but not limited to, ...harmful nuclear, biological or chemical emissions; or other polluting atmospheric activity.

Outlawing the oil and gas industry's knowing pollution of the atmosphere with Carbon Dioxide and Methane may not be L.D. 825's sponsors' intention but given the damage that greenhouse gasses and other climate forcing agents continue to do, the state could apply fees to cover the costs of developing and deploying safe methods of reducing and removing those already emitted. It is about time that we all recognize what science has proven since at least the 1980's -- that continued use of fossil fuels will cause serious damage to our environment and human health. State governments are beginning to recognize this and are suing major oil companies for damages and beginning to legislate fees on greenhouse gasses. These fees could be used to fund the research and development, assessment and deployment of greenhouse gas removal methods that are proven to be safer than withholding them would be - but only if these bills are not enacted as written for they could block the very remedies that we need while also banning those we do not need.

We Need to Remove Excess Greenhouse Gases, Not Just Reduce Emissions.

The year 2023 shattered global temperature records and broached the dangerous 1.5 degree C above normal warming target generations ahead of long-held projections. The European Commission's Copernicus Climate Change Service described the temperature in 2023 as "remarkable and unexpected". May 2024 was the twelfth month in a row of record-breaking monthly global temperatures. (<https://climate.copernicus.eu/may-2024-marks-12-months-record-breaking-global-temperatures>). Numerous outlets suggest that 2024 is on track to exceed the 1.5 degree C target for the second year in a row.

The World Meteorological Association says that May 2023 through June 2024 was 1.63 degrees C above normal. The "dangerous" 1.5 degree C warming threshold is now upon us. Our carbon budget has been depleted. Future emissions elimination (alone) cannot change our future. The reason is that active Earth systems tipping point collapses (the Amazon, Greenland and



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Antarctic ice sheets, permafrost, etc.) are irreversible unless the thing that caused the collapses to begin is removed (the warming). Because future emissions elimination only reduces future warming, this means current warming continues and creates irreversible tipping point collapses with natural system feedback forcings. This is the rationale for a restoration target of less than 1 C, which is the maximum average global temperature of our old climate, also known as the natural variation of our old climate and the boundaries of our Earth systems' evolution. Because these tipping point collapses complete and become irreversible in time frames that are likely sooner than 2100, decadal time frames are now required to restore our climate so that tipping systems stabilize.

James Hansen has observed that the 2023 El Nino was only moderate, but that temperatures were exacerbated by the reduction in aerosols by the ocean shipping industry in the north Atlantic. So the agents causing warming have been present or in the pipeline but were masked by the human-controlled reflective aerosols of pollution from ships. Therefore, because future emissions alone cannot halt earth systems tipping collapses that are already active, renewed action to draw down existing greenhouse gasses in the atmosphere is warranted. Because this drawdown process is lengthy, and irreversible tipping time frames are short, rapidly deploying learning by doing research for direct climate cooling interventions is also warranted, as emergency cooling is now indicated. A list of peer reviewed papers explaining this process is provided below for additional background.

We Need To Assess, Develop and Govern Climate Interventions.

We would note that limits and controls must be in place so as to prevent such cooling interventions from harming the environment even during the field research phase as there are several different approaches that vary in the likely collateral and direct effects. These should begin with the least risky of interventions.

That seems to be part of what the sponsors of L.D. 499 want to learn about with their exemption:

2. Exemption; reporting. The prohibition on geoengineering in this section does not apply to scientific research activities authorized by the department that are conducted in a controlled environment and that do not involve weather modification techniques or the intentional release of substances or particles into the atmosphere or the environment. ...

In order to do meaningful tests, however, that provision should allow the relevant agency to approve exemptions that cover small field tests of approaches that are not going to harm the environment. For example, we know that the relative absence of whales and large fish that used to fertilize the surface of the ocean with iron and other minerals and gently feed phytoplankton is in many places reducing the recovery of depleted plankton and the fish and whales that depend on it. We also know that iron is used in shipping fuel already in small amounts if we were to permit ships to add a small amount of iron when they are over areas that lack iron, we could



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measure how much methane the iron removes as it interacts with the sun and chlorine from sea salt spray to oxidize methane into water and tiny amounts of CO₂ which is only 1/80th the power of CO₂ over its twenty-year impact period. That would also reduce the formation of ground level ozone, which is a climate pollutant and a direct human health threat.

Then the iron would fall to the sea surface where it could restore plankton, feed the whole food chain and have much of that sea life drop to the ocean floor where the Carbon in it that had been taken from the ocean by fish and the air by whales would be sequestered for ages allowing the ocean to absorb more legacy CO₂ from our fossil fuel burning.

Ending our massive use of fossil fuels and other climate forcing activities requires a thoughtful but serious program of transition. The problem of global warming can and must be solved by a combination of greater energy efficiency and energy storage, well situated solar and wind power, and specific, well-measured, tested and governed climate interventions, including some methods of greenhouse gas removal. This is what the cautious Intergovernmental Panel on Climate Change (IPCC) has been recommending for several years now as the IPCC experts recognize we have overshoot the mark of safety, have not reduce greenhouse gas emissions, and must now actively remove substantial amounts of them. So the U.N. Framework Convention on Climate Change has set up a program under Article 6.4 of the Paris Agreement to allow developed countries to help developing countries to remove greenhouse gasses and share the credit with them towards the Nationally Determined Commitments of each partner nation to reduce its emissions.

In another step at home, the Inflation Reduction Act created billions in funds from the EPA and USDA to help states and even small rural towns to reduce and remove GHGs as well. Many removal methods have additional benefits for human health such as reducing ground level ozone by reducing the methane that helps create that damaging pollutant. Unfortunately the Trump Administration has blocked much of the IRA funding from reaching the states and being put into effect.

We need to encourage, and not ban, safe practical cooling steps.

Maine is becoming hot enough in the summer for many buildings to need a form of cooling. Yet, this provision in the second bill's list of dangerous practices, though oddly not included in the banned methods, could outlaw the use of light colored or alternating light and dark roof coverings.

From L.D. 825:

D. "Solar radiation management" means any technique designed to reflect a portion of the sun's radiation back into space.

That is a very broad definition.



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The bills do raise valid concerns about some climate interventions that pose serious risks but we must not confuse benign methods with dangerous ones just because they sound alike or one is a small subset of the other larger category. For example, solar radiation management (SRM) is a very broad term that includes the dangerous proposal called Stratospheric Aerosol Injection (SAI) and SAI sounds a lot like the use of Iron Salt Aerosols (ISA) to remove methane from the lowest levels of the atmosphere, or troposphere, just a few hundred feet above the ocean's surface.

Franz Oeste, Ph.D., one of the founding fathers of climate-related atmospheric chemistry, who moved from his native Germany to the U.K. years ago but continues to work today in his late 90's, described one of the very serious problems with SAI in an email to colleagues in the second week of March 2025:

[T]he best argument against the SAI method: an accepted problem of the SAI method is the "Termination Shock". This happens when the 100 years-lasting SAI campaign is stopped suddenly, for instance, in the 30th campaign year: in such case the full undimmed sun radiation hits an atmosphere with a strong enhanced greenhouse gas level and a strong decreased methane oxidation capacity. This makes a many years lasting average surface temperature jump by several Celsius degrees and thus might induce the man-made catastrophic extinction event.

Existing SAI models always excluded such termination shocks.

And the problem Dr. Oeste describes is just one of SAI's many problems. They include the likelihood of impeding the natural sequestration of CO2 by trees and ocean life.

Instead of supporting these two bills as introduced, the Committee should acknowledge both the risks and the promises of climate interventions and foster active research and licensing to prevent dangerous interventions and deploy safe ones.

Greenhouse gas removal methods should always be a complement to emissions reductions to the extent possible. Such reductions should include the phaseout of landfill practices and concentrated animal feeding operations that produce methane that could otherwise be avoided. Removal methods should first emphasize restoring natural processes that sequester carbon, oxidize or otherwise consume methane, and the like, and avoid reliance on perpetual additions of material or other interventions once an appropriately healthy level or cycle has been established.

Conclusion

We therefore urge the Committee to report out a bill that will empower state agencies and universities and technical centers, not just the DEP, to research, develop, assess, and deploy methods of removing all direct and indirect (e.g., hydrogen) greenhouse gasses and other climate forcing agents, such as black soot, well beyond a net zero or offset level. These same institutions should also assist in developing and implementing governance for that process, with the objective



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of restoring such climate forcing agents to levels that nurture and sustain human and ecosystem health, including for example, fewer than 350 ppm CO₂ and .8 ppm methane.

Any climate interventions with significant potential effects on the environment, including but not limited to Greenhouse Gas Removal, should be subject to full environmental and biological impact assessments, with initial field testing and further deployment controlled or governed by non-commercial entities, and subject to effective controls and limitations to ensure that they are not overdone, underdone, improperly done, or withheld when needed.

Thank you.

[John Fitzgerald](#)
Co-Chair of Legislative Team
Sierra Club Maine

For Further Information

The National Academy of Sciences recommendations for research and development of Ocean - based CO₂ Removal (<https://nap.nationalacademies.org/catalog/26278/a-research-strategy-for-ocean-based-carbon-dioxide-removal-and-sequestration>)

The National Academy of Sciences recommendations for research and development of methods of Ambient Atmospheric Methane Removal <https://www.nationalacademies.org/our-work/atmospheric-methane-removal-development-of-a-research-agenda>

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