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RECOMMENDATIONS FOR THE NEW ADMINISTRATION

Prioritize Both Engineered and Natural Solutions for Effective GHG Mitigation

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This brief is part of a series of policy recommendations for the administration of President Joe Biden. Focusing on a range of important issues facing the country, the briefs are intended to provide decision-makers with relevant and effective ideas for addressing domestic and foreign policy priorities. View the entire series at www.bakerinstitute.org/recommendations-2021.

INTRODUCTION

U.S. greenhouse gas (GHG) emissions totaled approximately 6.7 billion metric tons of carbon dioxide (CO_2) equivalent in 2018. Of that amount, CO_2 accounted for 81%, followed by methane (10%), nitrous oxide (7%), and fluorinated gases (3%). Non-CO_2 GHGs can be abated through measures that pose minimal threat to economic development.[1] So, those pathways should be fully explored. However, efforts to address climate change in the U.S. and abroad typically focus on mitigation of CO_2 due to its prevalence in the GHG portfolio. The vast majority of CO_2 emissions result from direct combustion of fossil fuels. Two sectors that are among the hardest to abate—transportation and industry—together account for over half of total energy-related CO_2 emissions.

The challenge of addressing the atmospheric accumulation of CO_2 will require a multitude of solutions. A comprehensive national strategy aimed at decarbonization should include both engineered and natural pathways for removal of CO_2 from the atmosphere. Focusing on net (rather than gross) emissions expands the portfolio of potential options to include various CO_2 mitigation options. The U.S. has a very specific comparative advantage in both engineered and natural carbon sinks, as it has tremendous technical depth, entrepreneurial talent, a rich geologic endowment, and lots of land dedicated to multiple types of uses.

NATURE-BASED SOLUTIONS

The Environmental Protection Agency (EPA) estimates that natural sinks in the U.S.—the country's forests, wetlands, and prairies—removed almost 800 million tons of CO_2 from the atmosphere in 2018, or about 12% of total U.S. emissions.[2] According to some estimates, nature-based carbon sequestration could account for 37% of the global emission reduction goals set forth in the Paris climate accords.[3] Other studies indicate that natural climate solutions have a global total potential absorptive capacity of 23.8 gigatons (Gt) of CO_2 equivalent (CO_2e) per year.[4] Global emissions stand at roughly 34 Gt of CO_2e per year,[5] so realization of the full potential of the natural system could be a powerful force.

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- Incentivize landowners to voluntarily participate in developing a baseline measurement of carbon in natural sinks. Measurement and verification are vital for the success of any natural solution. Establishing a verifiable baseline measurement so that ecosystem carbon flux can be characterized is important for the development of any nature-based carbon solution.
- Dedicate more funding for research and development of carbon flux measurement. Accurate characterization of how land use changes and soil amendments alter carbon uptake through natural systems is critical, but such a process has never been commercialized. R&D efforts into rapid measurement of carbon flux could trigger sizeable investment in natural solutions.
- Support pricing mechanisms that incentivize the enhancement of natural sinks through land management techniques and soil amendments. To the extent that co-benefits such as increased soil fertility, drought resistance, and other ecological services are realized, land use activities incentivized through a market for natural solutions, such as soil carbon storage, can enhance the overall value of agricultural activities. The U.S. is the largest exporter of agricultural commodities to the world, so any co-benefits will enhance the global impact of U.S. agriculture.
- Create a central clearing-house or regulatory agency that establishes a minimum requirement for certifying natural carbon sinks. This would allow individual states to apply for regulatory authority over carbon markets that involve nature-based solutions within their borders. The potential to store carbon in soils depends on the type of land as well, with variance in mitigation potential between forests, agriculture and grasslands, and wetlands. Given that the agricultural footprint of each state varies, this would allow each state to oversee carbon storage certification that is most appropriate.
- Incentivize soil amendments, like biochar, that are known to mitigate non-CO_2 GHGs in agriculture and provide several other co-benefits. Soil amendments like biochar increase water-holding capacity, improve soil health, and enhance nitrogen (N) uptake. This improves crop resilience and mitigates negative environmental externalities associated with nitrous oxide (N_2O, a potent GHG associated with agriculture and the application of nitrogenous fertilizers) and N runoff (a problem that stimulates algal blooms that contribute to the dead zone in the Gulf of Mexico).

ENGINEERED SOLUTIONS

Efforts are underway to expand engineering-directed efforts to capture CO_2 emissions and either inject them into a subsurface formation, such as a saline aquifer, or utilize them in other processes. The massive scale of existing global energy infrastructure presents a legacy that make such approaches particularly effective. A growing body of literature continues to emphasize the important role that carbon capture technologies must play if certain carbon mitigation strategies are to be met. Work by organizations such as the International Energy Agency[6] note that the suite of carbon capture utilization and storage (CCUS) technologies is unique because it "contributes both to reducing emissions in key sectors directly and to removing CO_2 to balance emissions that are challenging to avoid—a critical part of 'net' zero goals."

Over the past decade, strong policy frameworks and incentives have played a central role in advancing renewable energy value chains associated with wind and solar power. Similarly, policy can play a central role in expanding carbon capture technologies. Commercial incentive can be derived from a number of factors, including investor-driven environmental, social, and governance (ESG) constraints on access to capital, fiscal policy support, a carbon tax, or market-oriented activities that explicitly price CO_2. Supportive policy and regulatory and commercial frameworks will underpin CCUS value chain development in the U.S.

- **Make permanent the 45Q tax credit.** Abating CO_2 emissions is not a goal that will disappear in 2026. The 45Q tax credit per ton of captured CO_2 is immensely helpful. However, the recent extension for start of construction to January 2026 to qualify still puts many potential projects at risk. A number of states are taking steps to clear legal and regulatory hurdles for CCUS investment, but work remains to be done at state and local levels where the infrastructure will be deployed. Federal legislators, therefore, are encouraged to support making the 45Q tax credit permanent, or at least extend the date further, so that any state and local impediments can be addressed. The tax credit conveys a commercial benefit to developers along the CCUS value chain, and could trigger broader use of tax equity finance measures for CCUS similar to those deployed in the financing of large-scale wind generation projects.
- **Increase appropriations to the Department of Energy for advanced carbon initiatives.** Robust R&D activities are broadly viewed as critical to the long-term health of any industry. An expanded R&D portfolio focused on the efficiency of existing CCUS technologies, new hydrocarbon combustion processes, hydrogen produced from hydrocarbon feedstocks, new carbon-based materials, and new uses of CO_2 in industrial and power generation activities can play a major role in achieving desired economic and environmental outcomes.
- **Allow the leasing of federal acreage for CO_2 storage.** By expanding access to suitable geologic sequestration sites, the U.S. government can play an important facilitating role in expanding the deployment of carbon capture technologies. In addition, the leasing of pore space for permanent CO_2 storage will provide a source of additional revenue for the federal government.
- **Streamline permitting for CCUS projects.** This includes permitting pipelines that cross state boundaries; moving CO_2 from onshore capture locations to offshore injection sites; and streamlining the evaluation of environmental impacts of new infrastructure siting to comply with National Environmental Policy Act (NEPA) requirements.

ENDNOTES

1. J. Reilly, M. Sarofim, S. Paltsev, and R.G. Prinn, "The role of non-CO_2 greenhouse gases in climate policy: Analysis using the MIT IGSM," *Energy Journal*, Multi-Greenhouse Gas Mitigation and Climate Policy, Special Issue #3, (2006): 503–520, http://www.iaee.org/en/publications/journal.aspx.

2. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks Fast Facts and Data Highlights*, April 2020, https://www.epa.gov/sites/production/files/2020-04/documents/fastfacts-1990-2018.pdf.

3. See "Nature-based Solutions," International Union for Conservation of Nature, https://www.iucn.org/theme/nature-based-solutions.

4. See Bronson W. Griscom et al., "Natural Climate Solutions," *Proceedings of the National Academy of Sciences of the United States of America* 114, no. 44 (October 31, 2017): 11645–11650, https://www.pnas.org/content/114/44/11645.

Also see D.A. Bossio et al., "The role of soil carbon in natural climate solutions," Nature Sustainability 3 (May 2020), https://doi.org/10.1038/s41893-020-0491-z.

5. See "Global Emissions," Center for Climate and Energy Solutions, https://www.c2es.org/content/international-emissions/.

6. See International Energy Agency, *CCUS in Clean Energy Transitions*, September 2020, https://www.iea.org/reports/ccus-in-clean-energy-transitions.

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