WORLD RESOURCES INSTITUTE

RESPONSIBLY SCALING DIRECT AIR CAPTURE

Access the full publication to learn more at wri.org/carbonremoval.

Carbon removal will be needed, likely at a large scale, to limit global temperature rise to 1.5 degrees C (2.7 degrees F), which is necessary to avoid the worst impacts of climate change. This must be a complement to, not a substitute for, deep reductions of greenhouse gas (GHG) emissions. Direct air capture (DAC) is one carbon removal technology that is receiving growing investment and interest.

DAC uses chemicals to capture CO_2 from the air and, when combined with geological sequestration or use in a durable product, removes it permanently. WRI analysis finds that DAC plants are expected to have similar on-site resource usage impacts (e.g., land, energy and water) as other types of industrial infrastructure, but significantly less on-site GHG and conventional air pollutant emissions, particularly if powered by renewable energy. Responsible project design and regulation under the existing U.S. environmental regulatory framework can reduce adverse environmental impacts.

At the same time, because DAC is an emerging technology and its impacts vary by project, assessments will be needed on a project-by-project basis to clarify expected environmental and social impacts in relation to alternatives or a no-action scenario.

Social impacts depend on the degree to which potentially impacted communities have access to information and can provide input into siting and project development decisions. Policies that require consideration of equity in DAC development will be necessary to avoid historical patterns of inequitable infrastructure siting.

Policy and Procedural Recommendations

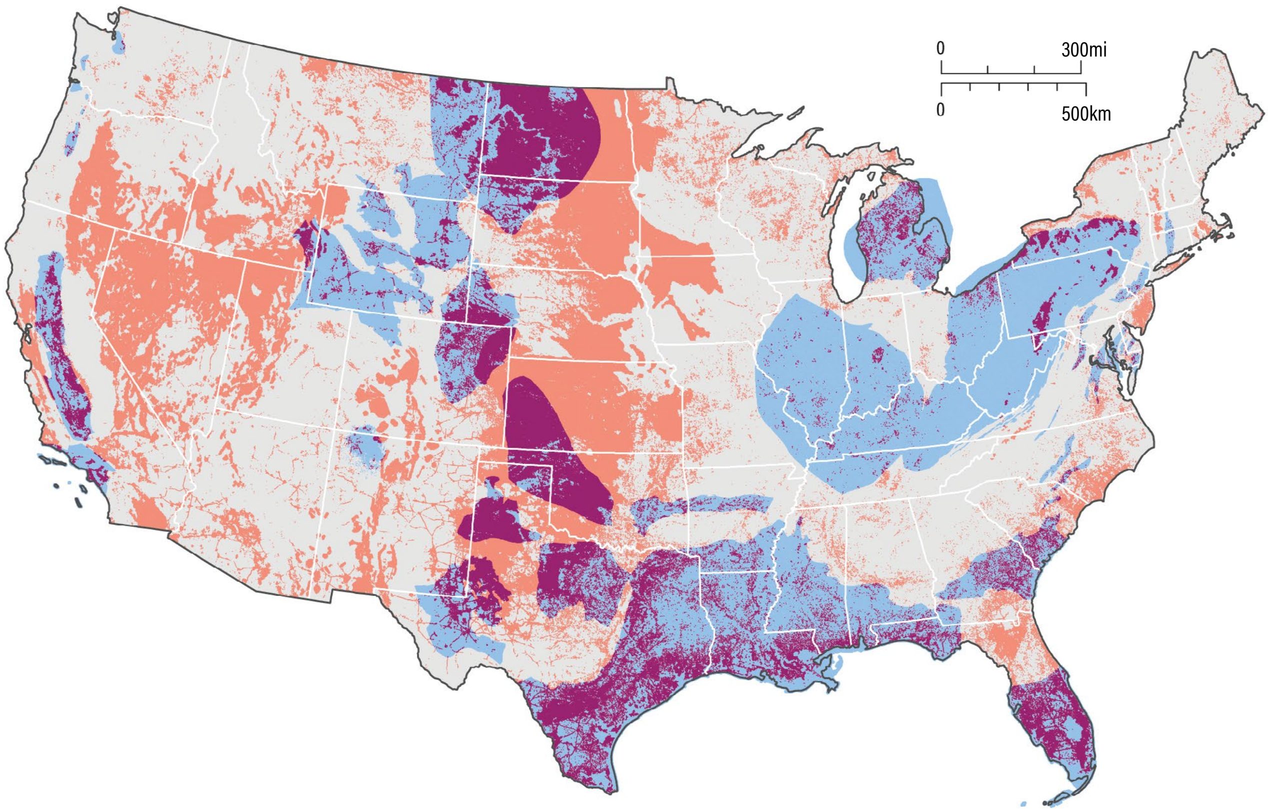
The historic investments that the federal government is currently making in carbon removal can be used to provide guardrails and incentives to ensure that DAC is scaled responsibly with equity as a key consideration. All DAC projects that receive federal funding should:

- Complete social and environmental assessments to identify suitable siting locations.
- Conduct meaningful community engagement to ensure that all stakeholders, including marginalized community members, can provide input on project development.
- Encourage the use of legal agreements, such as community benefit agreements, to ensure communities and workers can negotiate benefits they expect to receive.
- Where possible, require that local labor and locally sourced, low-carbon material be used for construction and plant operation.
- Establish job training programs in communities adjacent to DAC plants and establish standards to ensure high-quality employment.

How Members of Congress Can Support Responsible Scaling of Direct Air Capture

- Leverage federal purchasing power to create a robust and long-term market for DAC with social and environmental guardrails that direct carbon removal procurements to prioritize equity, access to economic opportunity, environmental integrity and responsible growth. (e.g., Federal Carbon Dioxide Removal Leadership Act).
- Increase annual federal appropriations for carbon removal research, development, and demonstration, which can help optimize DAC's efficacy and reduce its negative impacts.
- Maximize whole-of-government coordination to accelerate research, development and demonstration, as well as monitoring capacity, of a suite of carbon removal pathways, including DAC (e.g., CREATE Act).

Potential for Deployment of Renewable Energy (Solar, Wind, Geothermal) and Geologic Sequestration for DAC



Carbon dioxide removal (CDR) systems

- Complete CDR system: potential for deployment of energy (solar, wind, geothermal) and geologic storage colocated
- Incomplete CDR system: potential for deployment of energy (solar, wind, geothermal) only
- Incomplete CDR system: potential for deployment of geological sequestration (deep saline aquifer in sedimentary rocks) only

Notes: This map shows where potential for solar, wind, or geothermal power is located, CO_2 could be stored in geological formations, and potential for both energy and storage are colocated. Due to data limitations, wind and solar availability are mapped only on converted lands, while geothermal potential is mapped across any land. Utilization of CO_2 in products would expand the above range to include areas where renewable energy, but not geological storage, is available. Transport infrastructure for CO_2 and/or consideration of locations where DAC could be powered by fossil fuel with carbon capture and storage (CCS) would also expand the above range.

Sources: Developed by Hélène Pilorgé using solar and wind data from Baruch-Mordo et al. 2019; geothermal data from NREL n.d.; Williams et al. 2008; and geological storage data from USGS 2013.

Federal support can continue to advance DAC technology to minimize environmental impact and enable cost-effective deployment. Federal action should support research including, but not limited to, the following:

- Conduct thorough life-cycle assessments of DAC plants and supporting infrastructure to clarify how impacts differ by geography, energy source and plant configurations.
- Evaluate existing regulatory frameworks and identify areas where more robust regulation could be needed to govern large-scale DAC.
- Improve techniques for manufacturing DAC components, including sorbents and solvents, in cost-effective and environmentally friendly ways.
- Identify and map parameters that should be used to determine optimal siting for DAC plants, including practical constraints and local considerations.
- Conduct social science research to assess public perceptions of DAC and tailor communication and outreach.