Why Carbon Dioxide Removal (CDR) Is Required

Emissions reductions alone will not stop global warming. Humans deposit around 40 gigatons of CO_2 into the Earth's atmosphere every year. This pollution accumulates over time—only a portion gets absorbed by natural sinks like trees, grasslands and oceans. Today, these natural sinks are weakening because they're saturated. Combined with temperatures that are rising faster than ever before in human history, and emissions reduction efforts that have fallen far short of goals, carbon dioxide removal is more important than ever.

1. Global warming is driven by cumulative CO_2

The concentration of CO_2 in our atmosphere is now higher than ever before in human history. Because of this, temperatures are also higher and climbing faster than ever before. Reducing emissions will only slow the rate of warming. The only way we can stop warming and restore temperatures to their historically safe levels is to start removing huge amounts of carbon dioxide from our atmosphere as soon as possible, preferably before the damage caused by warming becomes irreversible.

2. We're out of time

Relying on emissions reductions alone, there is no credible solution for keeping our planet's temperature to below 1.5°C. Even the "well below 2°C" goal established in the 2016 Paris Agreement is now unrealistic. Current projections indicate that, without additional interventions, global warming is likely to approach 3°C by 2100. Some estimates put this increase even higher since projection models break down after 1.5°C.

3. Adaptation isn't feasible in a 3C world

Many climate impacts—such as sea-level rise, ice-sheet loss, extreme heat thresholds, and ecosystem collapse—cannot be fully adapted to, particularly as warming increases. This is especially true for the vast majority of the world's equatorial regions. As temperatures rise, the scale and costs of adaptation will become economically and physically untenable, and the consequences will be mass migration and sociopolitical collapse.

4. Carbon dioxide removal is a complement, not a substitute

CDR has never been optional or speculative. It has simply been overshadowed by our emissions reduction efforts. CDR is essential, however. Without it, we have no realistic way to keep our planet from overheating. At the same time, emissions reductions efforts remain essential as well. Without these, the scale of CDR required may become unachievable.

5. This is real

CDR research and industry are both highly developed, and more and more governments are beginning to add CDR to their Paris Agreement NDCs. The next step in the evolution of CDR is for governments to unite behind the Vancouver Declaration so they can begin working together on the challenge of rapidly scaling CDR.

6. Key references

Smith, Steve, et al. The State of Carbon Dioxide Removal: Second Edition. Oxford: Oxford Institute for Carbon Removal, 2024.

Intergovernmental Panel on Climate Change (IPCC). Climate Change 2022: Mitigation of Climate Change. Cambridge: Cambridge University Press, 2022.

Lawrence Livermore National Laboratory. Roads to Removal: Options for Carbon Dioxide Removal in the United States. Livermore, CA, 2023.

The Vancouver Declaration on Carbon Dioxide Removal is a voluntary, non-binding soft-law instrument designed to:

- Support dialogue among governments on CDR policy and governance structures;
- Encourage information-sharing and capacity-building on issues such as standards, best practices, regulation and investment;
- Promote coordination across governments, jurisdictions, and regions; and
- Complement existing national and international climate frameworks without replacing them.

The Declaration is enabling rather than prescriptive, and is designed to lower barriers to engagement on a complex and emerging policy domain. The Declaration does not create legal obligations; require legislative approval; mandate specific technologies, targets, timelines, or funding commitments; or create a centralized authority with decision-making power over national actions.

The Declaration process is a secretariat-governed forum developed by CDRANet, an international network of several hundred experts spanning climate science, policy, industry, and civil society. The CDRANet initiative has been convened by the Science Communication Institute, a US-based non-profit organization acting as a neutral, non-advocacy convener in support of international policy dialogue.

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