

Near and longer-term priorities for international governance of carbon dioxide removal

DISCUSSION PAPER

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Executive Summary

Carbon dioxide removal (CDR) encompasses a broad set of methods, which together—and in conjunction with emissions reductions—are essential for addressing climate change. This assessment of the current institutional landscape reveals that a governance gap exists. Because of urgency in scaling up CDR, we argue that now is the time to develop new institutional functions to facilitate the deployment of sustainable CDR to gigatonne scale. Examples of previous institutional innovations, as well as a framework of necessary governance functions, provide guidance for institutional design. Further, an array of nascent CDR initiatives have the potential to address important aspects of the governance gap, while missing others. We see an effective pathway, in which 1) an initial set of capabilities focused on data, coordination, and signalling is established, 2) in a transitional phase, additional functions—implementation and policy analysis—are phased in, and 3) in the longer term, the governance gap is filled with coordination of rules and standards. Transparency and engagement with diverse stakeholders throughout will be central to this process of building governance capacity. A regime of international organizations that encompasses the full scope of CDR methods would provide robust governance in the face of persistent change and uncertainty over the coming decades.

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ES. 1. Meeting climate goals requires both rapid emissions reductions and deployment of CDR.

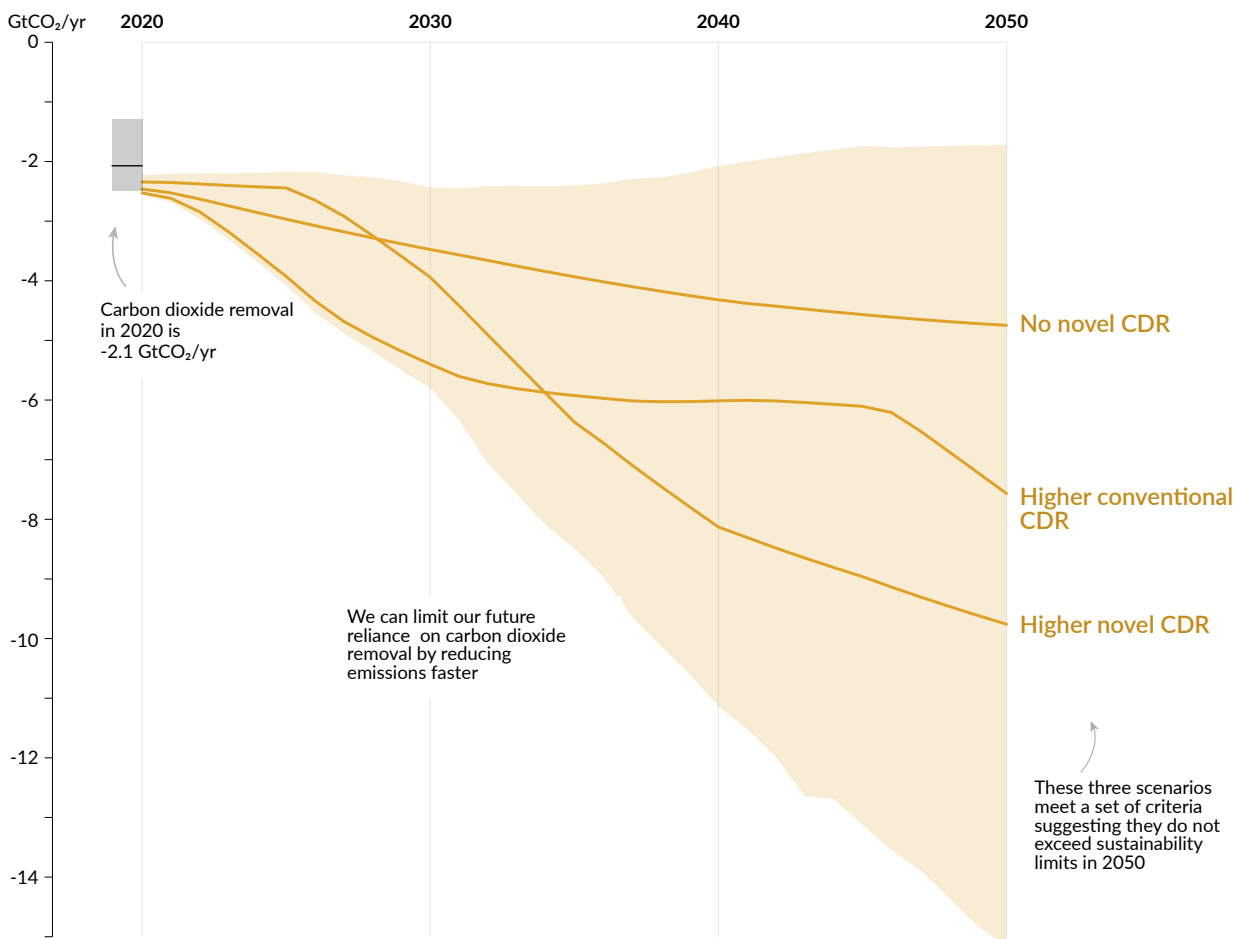
Meeting the Paris Agreement's long-term temperature goal requires both emissions reductions and carbon dioxide removal (CDR). The most important mitigation strategy in the near term is reducing emissions. But global greenhouse gas emissions continued to grow in 2025, a trend which is incompatible with climate targets regardless of how much CDR is deployed. Deep and rapid emissions reductions are essential but insufficient for achieving net zero and thus stabilizing global temperature.

Removing carbon dioxide (CO₂) from the atmosphere is also necessary to meet climate goals. CDR consists of human activities capturing CO₂ from the atmosphere and storing it durably in geological, terrestrial, ocean reservoirs, or in products. How much CDR we will need depends in part on the peak global temperature we reach and how quickly

and by how much we reduce emissions, among other factors. But even with those uncertainties, modelling shows that to meet targets, we will need to deploy well over a hundred gigatonnes of CDR between now and when we reach net zero emissions. Scenarios, in which high mitigation ambition is pursued with immediate action, show a scale up from current CDR—about two gigatonnes per year—to seven to 13 gigatonnes per year in mid-century. Almost all current CDR originates from conventional CDR (primarily afforestation and reforestation); only two megatonnes of novel CDR (more recently developed methods) have been deployed, and they need to scale up to several gigatonnes over the next 25 years. This rate of scale up is possible but on the very high end of previous expansions of technology. There is thus urgency to deploying novel CDR as well as maintaining and expanding conventional CDR, while accounting for sustainability constraints.

Carbon dioxide removal is a feature of all 1.5°C scenarios that meet the Paris temperature goal, in addition to reducing emissions

Carbon dioxide removal (GtCO₂/yr), in 2020 and in three Paris-consistent 1.5°C scenarios



ES Figure 1. Carbon removal in Paris-consistent emissions scenarios.

ES. 2. International governance would facilitate deployment of CDR

As in other areas, coordinating aspects of CDR development at the international level can spread knowledge, inform policy design, and catalyse deployment, among other activities. Many of these activities would be duplicative at the national level, so there are gains from aggregation of capabilities and information. We use the IPCC definition of governance as “the structures, processes and actions through which private and public actors interact to address societal goals.” Evidence from past efforts shows that broad international cooperation can accelerate deployment and extend the benefits of new technologies beyond early movers. For example, governance of oil supplies in the 1970s built resilience among members of the International Energy Agency, and governance of renewable energy at the International Renewable Energy Agency (IRENA) diffused policy design to dozens of countries. For CDR, governance is widely recognised as a necessary ingredient for robust, transparent, fair, and participatory innovation ecosystems, project deployments and CDR markets. But as we document here, governance of CDR at the international level to date is limited to nascent initiatives and consequently a governance gap exists. Further, we are missing a comprehensive approach, encompassing the full range of diverse CDR methods. We thus expect strong benefits from the establishment of an international organisation performing governance functions currently missing.

ES. 3. Now is the time to fill the CDR governance gap

Our assessment finds that it is time to establish an international institution—or significantly strengthen capacity and coordination of existing institutions—to develop robust national and international governance mechanisms for CDR. Many CDR approaches are at an early stage of development, with few shared definitions or policy approaches. There is immediacy to this governance challenge because of the urgency of the climate problem and because of the time it takes for new institutional capacities to be adopted, implemented, and expanded. Climate impacts are becoming more intense and pervasive while global emissions still grow. Net zero targets have been adopted by countries representing >80% of global greenhouse gas emissions. The number of start-ups and level of investment in CDR are rising. But as the State of CDR reports show, there is still a multi-gigatonne difference between country pledges and what is needed in Paris Agreement-compatible scenarios. Institutionally, IRENA, for example, took a decade from initial concept to establishment of a new institution, and further time elapsed until the institution performed its full suite of functions. There is thus a need to progress faster and to initiate that institutional development process soon. The current multi-lateral landscape is facing profound challenges, which while imposing difficulties, also creates opportunities for novel forms of pluri-lateral governance.

ES. 4. Systematic assessment of governance functions gives insight on past and current initiatives

We adopt a methodology that involves: describing mechanisms by which international coordination addresses barriers to scale up; identifying governance gaps; surveying existing initiatives; describing options for filling governance gaps; and prioritising functions to implement. We employ a framework of six essential governance functions: 1) signalling and guidance; 2) rules and standards; 3) implementation, finance, and capacity building; 4) data, knowledge, and learning; 5) policy analysis; and 6) convening and coordination. We apply this framework to established climate-relevant international organisations and to 12 CDR initiatives. The results show where governance supply is ample, partial, or absent across our sample, and informs our recommendations for a sequence of functions for a new or enhanced existing institution. It also provides us with a set of promising strategies that we observe both in CDR initiatives as well as in existing institutions.

ES. 5. Previous institutional innovations provide a playbook and show expanded scope over time

Historical analogues show that nascent organisations with a limited set of functions can evolve into durable institutions that grow in scope to serve a broader set of activities over time. Trusted information has played a particularly important role in building legitimacy, especially when coupled with early efforts to enhance awareness of the potential gains to cooperation. Among the institutions analysed, IRENA provides the most directly relevant model for how an international institution can catalyse progress in a nascent sector. A trusted knowledge base (REN21) provided the foundational capacity to enable the launch of a new international organisation (IRENA). The International Energy Agency shows how both scope and membership can grow over time and that core mission can evolve to maintain salience. Mission Innovation and the Clean Energy Ministerial show the potential for high-level convening of leaders, to coordinate goals and identify priorities. In multiple cases, a crucial contribution came from policy entrepreneurs—public officials who can galvanise support within their governments and cultivate a coalition of willing partners. In addition, the explicit mention of multiple benefits in visions and mission statements has been important. Key implications for CDR are to:

1. begin with a limited set of functions to expand over time;
2. identify policy entrepreneurs to enable nascent support;
3. use shared data to establish credibility and legitimacy; and
4. clearly communicate the multiple benefits attributable to international coordination.

However, development of CDR governance must progress more quickly than previous organisations, if these solutions are to reach the scale necessary to keep the Paris long-term temperature goal within reach.

ES. 6. Emerging CDR initiatives emphasise signalling and coordination

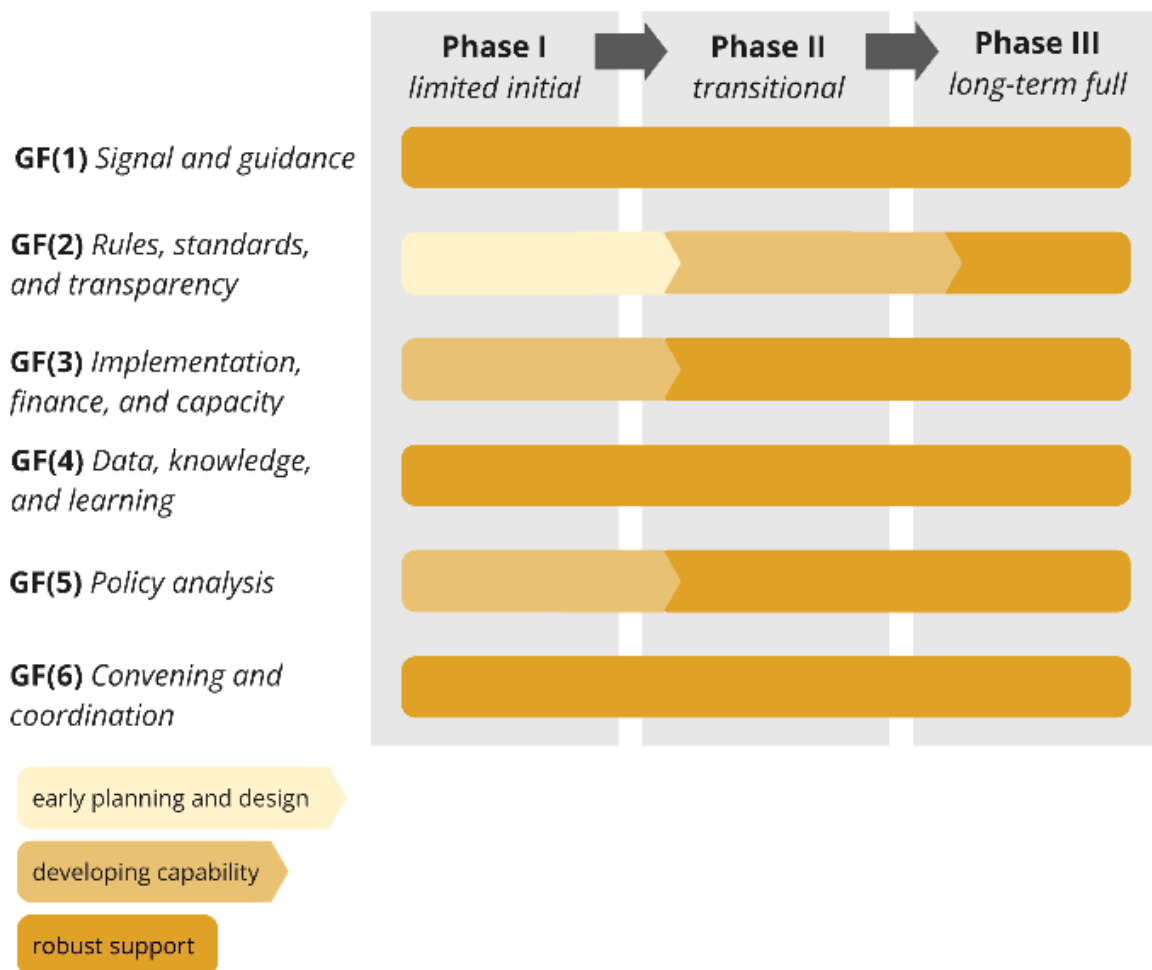
We identify 12 CDR initiatives with clear plans about how they would contribute to CDR governance in terms of the six functions of governance. We find the most emphasis on two functions: signal and guidance; and convening and coordination. At least half of sampled initiatives demonstrate evidence of playing a role in coordination and signalling while data, knowledge, and learning was present across five initiatives. These results are well aligned with the analysis of non-CDR historical analogues described above. We see less, but some, activity in: implementation, finance, and capacity; and policy initiatives—areas with potentially greater needs for governance development. While such activities are planned across many initiatives, meaningful activity was only identified at two initiatives. Across sampled initiatives, we found no evidence of demonstrated supply of governance for rules, standards, transparency—a critical area for establishing and upholding integrity for CDR—despite that such functions appear planned or partially supplied at eight initiatives.

ES. 7. Near-term priorities for CDR are data, coordination, and signalling

A first implication of the analysis is that convening and coordination, signalling, and knowledge creation and dissemination are high value functions to initiate early on. Over time other essential functions, such as coordination of rules and standards, will need to be developed. We thus recommend a phased approach that balances where the most acute gaps are and the feasibility of addressing them. In Phase 1 we prioritise fully functioning programs in signal and guidance; data, knowledge, and learning; and convening and coordination. Those are essential programs that build legitimacy and credibility for the organisation, setting the stage for developing governance capacity for other functions. We thus also see Phase 1 as a time to identify and build capability in implementation and finance; and policy analysis. Phase 1 is also a time to initiate dialogue among participants to develop early plans for more contentious issues such as rules, standards, and transparency because they require more intensive dialogues among stakeholders.

ES. 8. Additional capabilities to develop in the longer term include rules, standards, and transparency

We recommend that in Phase 2, the existing programs continue while new programs in implementation and policy analysis are launched as fully functioning programs. That phase is also a time to shift the dialogues on rules, standards, and transparency to developing capacity to implement those as functions of the organisation. In Phase 3, the five established programs continue and the program on rules, standards, and transparency is launched. At that point the organisation will be performing all six of the governance functions.



ES Figure 2. Proposed Progression of functional coverage for CDR governance across three phases of development.

In implementing this proposal, an array of issues will need to be considered, and priorities kept in mind, including equity, the role for capacity building, and more generally engaging the Global South. Another will be establishing sufficient budget for a secretariat to perform Phase 1 functions. Membership and contributions will also be critical issues, as will coordinating government engagement on functions that span multiple government agencies. Above all, finding a way to establish the secretariat and move through the three phases at a faster pace than analogous historical examples will be an essential mandate for the organisation. We identify several promising strategies in this assessment: elevating co-benefits; flexible membership, tailoring to context; broadening scope over time; building on existing capabilities; and engagement of diverse stakeholders. The authors are using this set of recommendations to begin a process of co-developing these and other implementation issues with partner organisations and multi-sectoral audiences with a Roadmap to CDR Governance report to follow.


In summary, a new institution dedicated to CDR governance would promote credibility and legitimacy for carbon removal while also systematically gathering lessons, good practice, and policy designs. This would comprehensively inform governments and other interested stakeholders about developments in the sector and provide practical information for supporting removals in their countries. In the near term it would provide a source of trusted information and in the medium- and longer-term support for rules, standards, and transparency among members.

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Feedback

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Photo: Harvesting sargassum from the intertidal zone at Devgad on India's Konkan coast. By Aaran Patel