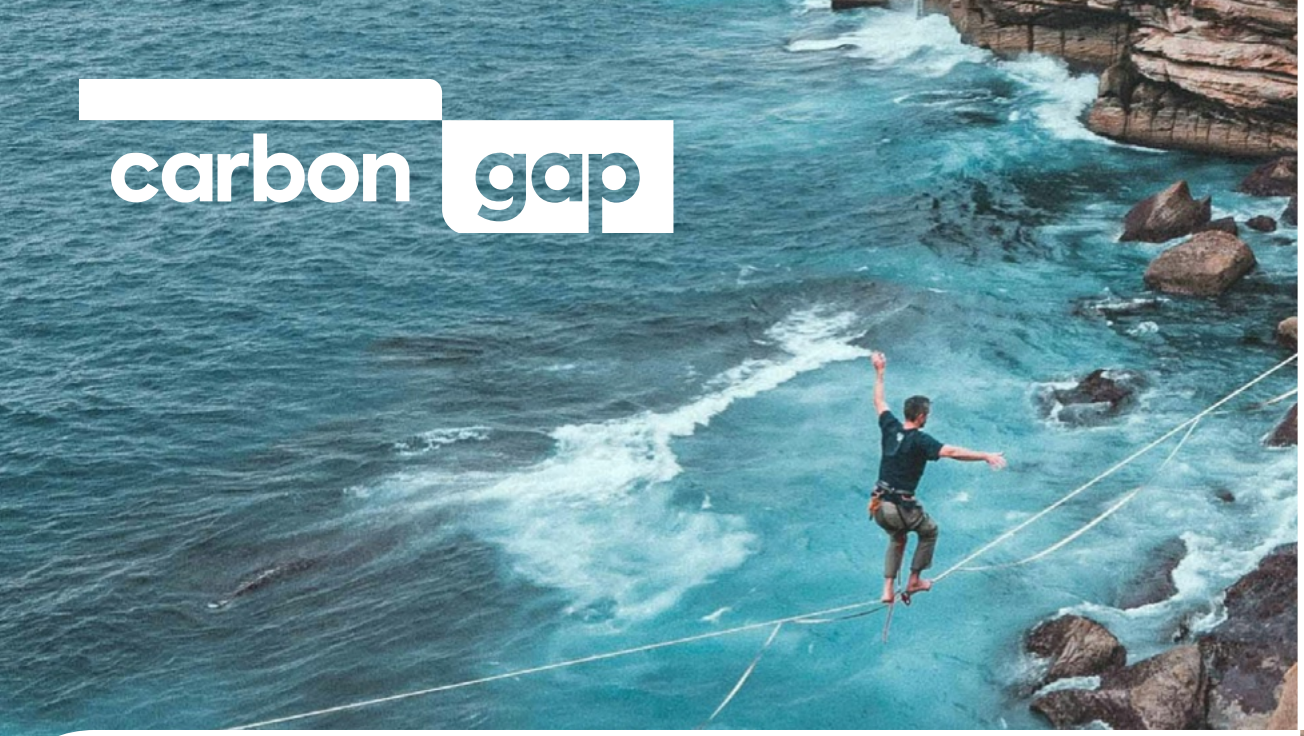


carbon gap

SETTING THE COURSE FOR NOVEL MARINE CARBON REMOVAL IN EUROPE

Bold research, careful rollout

A credible pathway to responsible development for Ocean Alkalinity Enhancement (OAE) and Direct Ocean Capture (DOC)

Eloisa Viloria & Sylvain Delerce

November 2026



EXECUTIVE SUMMARY

Marine carbon dioxide removal (mCDR) has the potential to become an important part of Europe's carbon removal portfolio and contribute to EU climate goals. However, although many mCDR approaches show promise, most still face a series of open questions around their real-world effectiveness, monitoring and verification, environmental and social safety, governance and scalability.

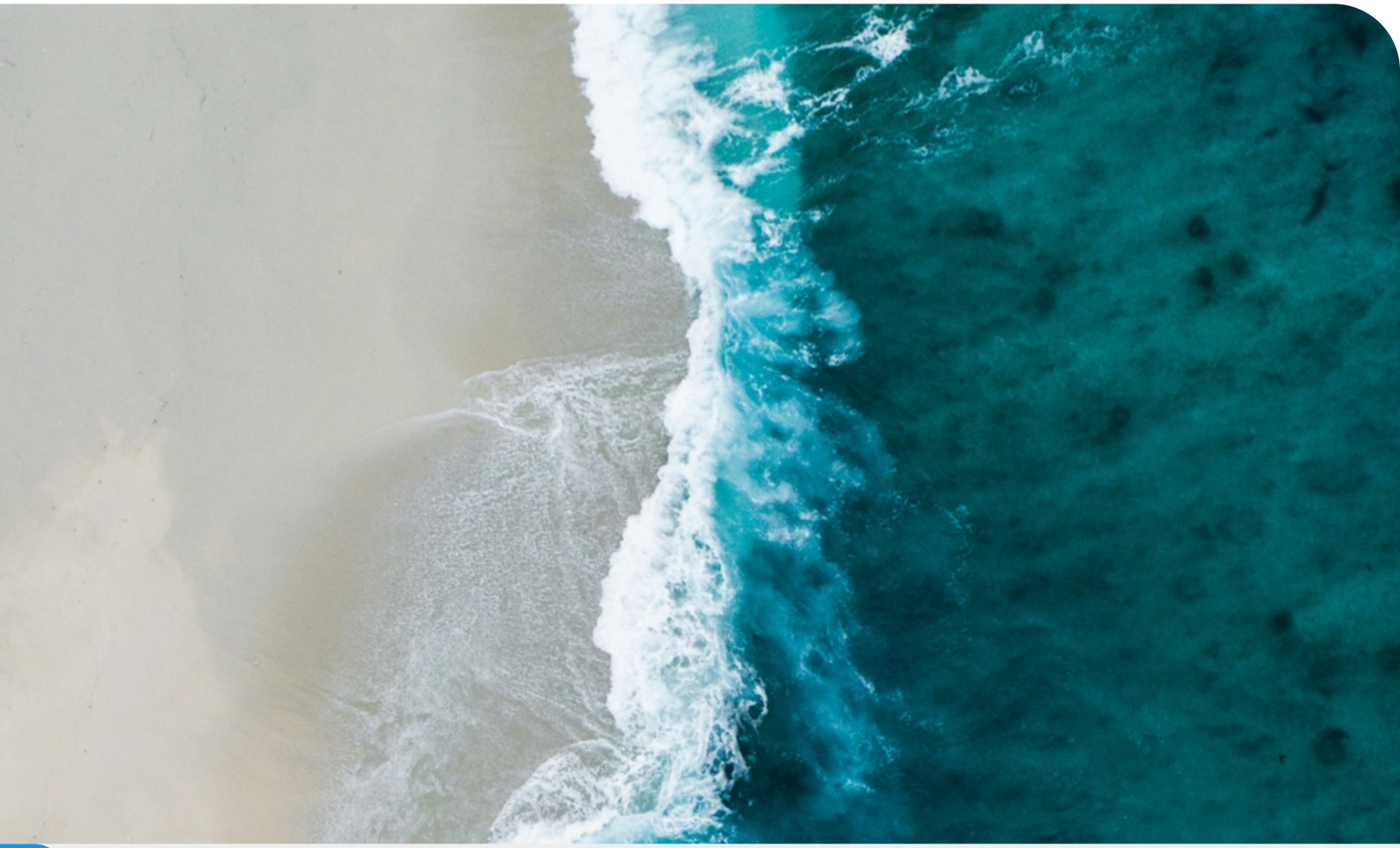
As the Commission evaluates the certification of Ocean Alkalinity Enhancement (OAE) and Direct Ocean Capture (DOCCS) under the Carbon Removals and Carbon Farming Regulation (CRCF), Europe must balance two risks: (1) rushing ahead while some uncertainties remain, and (2) inaction, further delaying and stalling the crucial innovation needed to move these methods forward. This paper goes beyond this binary choice and proposes a structured pathway to advance the evidence base, support coordinated research and the development of these methods, and, where appropriate, progress towards deployment.

KEY TAKEAWAYS

- Europe needs **a clear pathway** and operating model to advance research and development on OAE and DOCCS. The CRCF framework can serve as a useful compass to coordinate research efforts, while keeping a pathway towards certification open as the science progresses.

- **The challenge goes beyond scientific uncertainty.** Fragmented research efforts, limited funding, and the absence of a mechanism to track progress hinder the responsible development of methods and their progressive integration into EU's regulations.

- **The current EU policy cycle offers an important opportunity** to act. The next Framework Programme and the forthcoming EU Ocean and Water R&I Strategy can strengthen and coordinate research efforts, while the CRCF can help identify and prioritise the evidence gaps that these efforts should address.





RECOMMENDATIONS

We recommend that the EU advances the responsible development of OAE and DOCCS while keeping a pathway towards certification open. To do so it should:

1. Provide **a clear political commitment to advancing novel mCDR** by clearly communicating the EU's objectives for novel mCDR and establishing a structured process with milestones to periodically assess scientific progress, conditions for responsible development and potential certification.

2. **Establish an overseeing body** responsible for driving and tracking progress on novel mCDR. This could take the form of a marine CDR sub-group under the Carbon Removal Expert Group.

Align research and funding around a shared agenda

3. **Adopt a shared marine CDR research and innovation agenda.** The Commission should establish a common agenda that sets priorities and milestones for addressing the knowledge gaps that limited the development of these methods, and where relevant, their certification.

4. Use the research agenda to **coordinate action across both funding horizons**. In the short term, the proposed mCDR sub-group could identify priority research needs to help guide available EU, national and private funding opportunities. Over the longer term, the EU should adopt a formal research agenda and inform future programming under the next Framework Programme.

Connect mCDR with broader ocean governance

5. **Embed mCDR within the wider EU ocean policy framework.** The EU Ocean and Water R&I Strategy should support the need for dedicated mCDR research agenda; the Ocean Act should recognise mCDR as a priority; the OceanEye and the wider European ocean observing system should support the data and monitoring capacities needed for MRV.

6. **Strengthen coordination across the Commission and with Member States.** The CRCF, research and innovation policy, ocean governance, and national permitting all need to evolve in a coordinated way across the Commission and Member States.



WHY MARINE CDR MATTERS FOR EUROPE

According to the IPCC, achieving climate goals will require 4–8 $GtCO_2$ of removals annually by 2050. The European Commission's Impact Assessment for the 2040 target similarly indicates that around 400 $MtCO_2$ will need to be removed annually, including 75 $MtCO_2$ from permanent CDR. Reaching these volumes is more likely to happen if we can mobilise a diversity of CDR methods in a portfolio approach.

The ocean is an important climate regulator, and currently absorbs about 25% of anthropogenic CO_2 emissions each year through air-sea exchange at its surface and uptake by photosynthetic organisms. This natural capacity to buffer some of global warming's impacts can be enhanced via human intervention by increasing the ocean's ability to take in and store carbon in its waters and sediments through a variety of methods collectively known as marine carbon dioxide removal (mCDR).

MCDR could be a good complement to land-based methods because it can help reduce land-use conflicts, add cost-effective CDR approaches to EU's portfolio, and lessen dependence on limited geological CO_2 storage. These advantages mean that large-scale marine CDR could be a game-changer for keeping 1.5 °C within reach and a **key element of the EU's carbon removal strategy**.

Although many mCDR techniques show promise, most are still new. Scientists agree that more research is needed to assess their real-world efficiency, establish monitoring best-practices, and understand their environmental and social risks. Moving these technologies out of the lab and into open-ocean field trials is also essential to test their performance under real-world conditions.

Europe is particularly well placed to lead on marine CDR, given its favourable geography, strong research base, and existing maritime infrastructure. But realising this potential will require a coordinated research effort to address the open questions, close the policy gaps, build robust monitoring, and supercharge innovation.

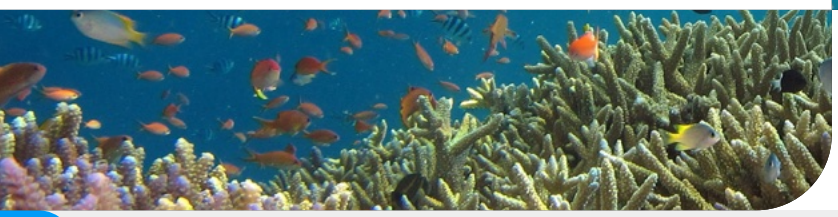
Currently, the EU faces two main risks when it comes to mCDR:

1. **Rushing ahead**: most mCDR approaches still involve significant uncertainties, while public awareness and support for these methods remain low. This uncertainty calls for a cautious, stepwise approach grounded in robust scientific evidence and strong environmental safeguards.

2. **Inaction**: the development of mCDR cannot be indefinitely delayed. Outstanding scientific and policy questions must be actively researched, and field tests are needed to either prove or disprove the various mCDR approaches.

Europe's challenge is to balance these two risks: ensuring that sufficient efforts are made to advance knowledge and determine which mCDR approaches have the most potential to contribute to climate goals, while maintaining high and robust environmental standards.





THE NEXT STEPS

The Commission is evaluating whether methods such as mineralisation, enhanced rock weathering (ERW), and two marine CDR methods—ocean alkalinity enhancement (OAE) and direct ocean capture (DOCCS)—can be certified under the Carbon Removals and Carbon Farming (CRCF) Regulation. *This brief focuses exclusively on the treatment of OAE and DOCCS referred to as "novel marine CDR", as the two mCDR methods currently under review.*

The tension between the risk of inaction and the risk of rushing ahead makes "yes or no" questions insufficient to capture a robust assessment of what is critical to progressing these methods while accounting for the remaining uncertainties.

Carbon Gap sees three possible scenarios:

Proceed with certification now

Certify OAE and/or DOCCS under strict conditions limited to well-defined use cases, mature applications, and appropriate environmental settings. Consider tiered certification to accurately reflect the level of remaining uncertainty.

PROS

+ Starts integrating mCDR into the EU climate toolkit;
+ Provides regulatory clarity and market confidence for innovations and investors;
+ Accelerates data generation and sharing, propelling innovation.

CONS

- Does not address the remaining scientific uncertainties that still block full certification;
- Raises the risk of premature marketisation and public resistance;
- Creates a higher administrative burden due to method-specific oversight needs;
- Adds environmental and reputational risks if certified projects cause unforeseen impacts.

Defer certification but adopt a formal pathway

Postpone certification of OAE and/or DOCCS, but establish a formal, time-bound pathway to revisit the decision, supported by a dedicated research and innovation agenda strategically addressing the main research gaps.

PROS

+ Ensures scientific and regulatory maturity before full CRCF certification;
+ Builds public and stakeholder trust through a precautionary approach;
+ Creates a predictable roadmap for readiness and future integration.

CONS

- Risks indefinite delay;
- May reduce industry momentum and support over time if there are no short-term policy signals;
- Vulnerable to fall into a funding gap and not address main open questions.

Status quo, no certification, no formal pathway

Neither certification nor a formal timeline is established; OAE and DOCCS remain outside the CRCF, with no defined process for future inclusion.

PROS

+ Low risk low resistance option politically.

CONS

- EU DOCCS and OAE development stagnates and innovation momentum is lost;
- Undermines EU climate goals by neglecting ocean-based removal potential;
- Kills the rationale for investing both public and private money into developing novel mCDR;
- Does not resolve scientific and policy knowledge gaps.

The Commission might conclude that certification as it is currently defined under the CRCF for OAE and DOCCS should not yet proceed. The question then becomes "what happens next?". There is a **risk of an indefinite delay (scenario 3)** and of losing momentum in the development and scaling of EU marine CDR projects and companies, potentially undermining the EU's technological leadership in marine CDR. While considering those risks, it is important to realise that Europe is currently uniquely placed to support progress on climate mitigation technologies like novel mCDR given the disengagement observed in other geographies like the USA.

Three forces drive this risk:

1. **Open scientific questions still need to be addressed** - some MRV and ecosystem-impact questions remain unresolved, making OAE and DOCCS hard to scale at this stage.

2. **Not enough dedicated funding** – there are few Horizon Europe thematic calls before 2028, and only limited EU funding opportunities until the next Framework Programme. The level of dedicated funding does not match the breadth nor the timing of the challenge.

3. **No revisit mechanism** – the CRCF is the main policy track to progress novel mCDR for now. Without a formal engagement to revisit novel mCDR certification readiness by a certain date, those methods would fall out of the EU agenda.

Based on the findings of the technical scoping papers published by the Commission in September 2025 and February 2026, and the subsequent feedback from the novel mCDR community, Carbon Gap considers that evidence is not sufficient to immediately pursue a full methodology under the CRCF for OAE and DOCCS that would generate credits.

The Commission's first priority should be to adopt a formal pathway to support the research and development of these methods and ensure progress on the remaining areas of uncertainty.

In the meantime, the Commission should create and communicate on a clear process from evidence to policy, including regular reassessments. It could also explore non-crediting approaches to testing the applicability of CRCF criteria to novel mCDR methods, helping identify outstanding evidence gaps and practical challenges before considering potential pathways towards certification (see Pillar I).



FOUR PILLARS FOR THE RESPONSIBLE DEVELOPMENT OF MCDR

Novel mCDR is needed to complement the EU's CDR portfolio and there is limited time to roll out its development. The EU must therefore take an active role in steering and supporting the responsible development of mCDR. Carbon Gap suggests that the EU adopt a **dedicated agenda** addressing the current shortfalls in terms of funding, coordination, research prioritisation, and awareness development.

Together, four pillars have the potential to unlock the path to safe marine CDR, and potentially, credible, high-quality methodologies.

EU's plan for novel mCDR

	I. An overseeing and coordinating body	II. A coordinated research agenda	III. Coordination with broader ocean governance	IV. A political commitment
What it is	Designates an institutional home for novel mCDR, with a clear mandate to oversee the progress of methods and coordinate efforts across relevant actors and regulatory frameworks.	Defines what "ready for deployment" means, identifies research priorities, and mobilises the resources needed to execute the present agenda.	Coordinates relevant Commission units together with diplomatic staff involved in international processes.	The Commission commits to coordinating and monitoring mCDR research, setting clear milestones and timelines to assess scientific progress, conditions for responsible development and potential CRCF certification.
Why it is needed	Establishes a clear point of coordination to track progress, align relevant actors, support the mCDR ecosystem, and inform policymakers on priorities and next steps.	Coordinates actors to close the gaps that hinder development.	Avoids fragmented policy-making and ensures that research, certification, and ocean governance develop in a coordinated way.	Gives an important signal that mCDR is on the EU's agenda and that the Commission is willing to advance the sector.

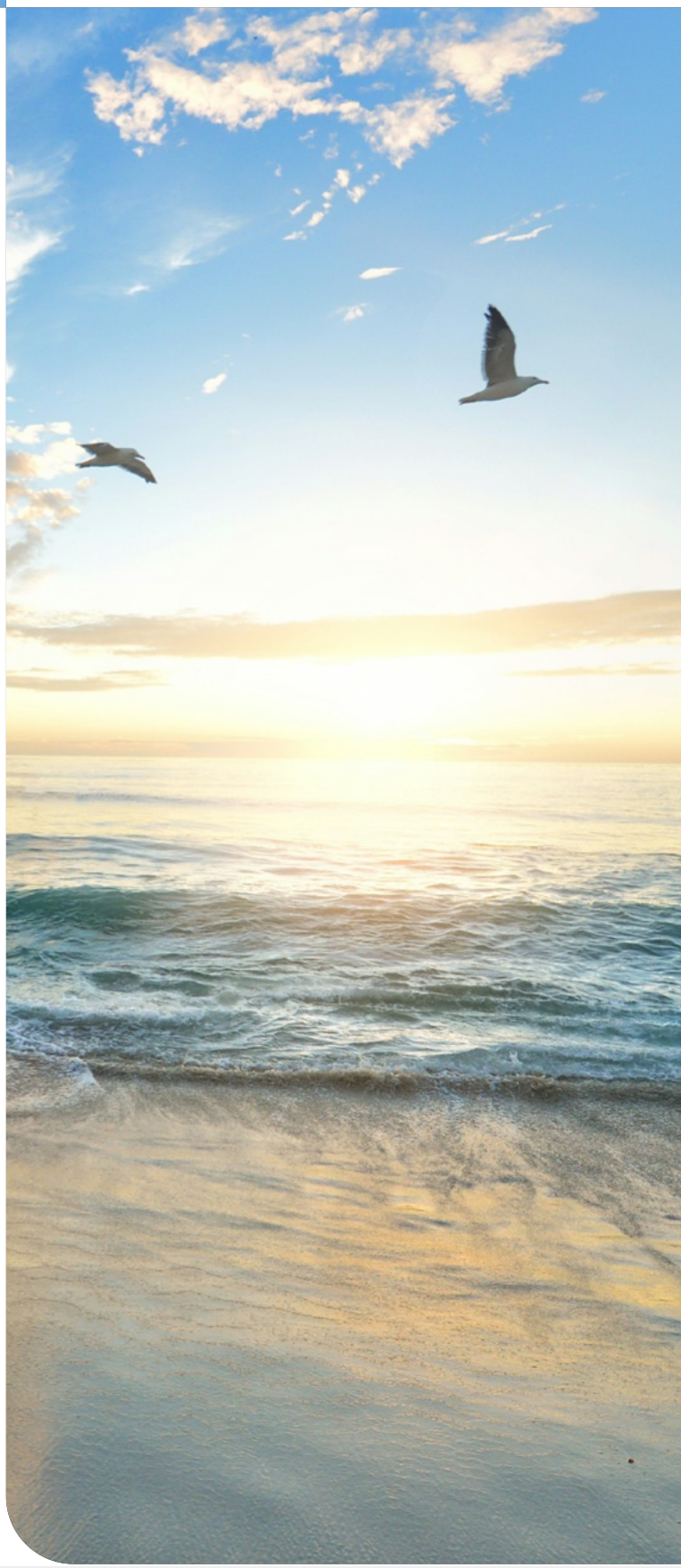
PILLAR I: AN OVERSEEING AND COORDINATING BODY

Novel mCDR methods sit across different domains and regulatory frameworks. As a result, responsibilities are spread across several actors, with no clear institutional lead to coordinate efforts and drive progress. Achieving efficient progress requires a stronger level of coordination and a clear institutional home for novel mCDR. An overseeing entity or body could support that role by connecting the different actors involved, driving the tactical agenda and regularly reporting on progress and next steps to the relevant decision making bodies.

Several institutional arrangements could fulfil this function, from the CLIMA unit of the Commission itself to mobilising existing entities like the European Scientific Advisory Board on Climate Change (ESABCC) or even the creation of a dedicated body, such as a marine CDR subgroup within the Commission's CDR Expert Group or a coordination and support action under Horizon (like the CREDIBLE project for carbon farming). Here, we illustrate how this function could be fulfilled through one example, while acknowledging that other arrangements may also be suitable.

The Commission's Carbon Removal Expert Group has so far played a substantial role in the development of method-specific methodologies e.g. DACCS, BECCS, and biochar. For earlier stage methods, as is the case of OAE and DOCCS, the expert group could also play a substantial role. However, it currently lacks sufficient expertise on mCDR.

Establishing a marine CDR sub-group could be one of the fastest available routes to set up an entity that (1) has proper technical understanding of mCDR, and (2) can, under the mandate of DG CLIMA, oversee the state of the science and development of methods.



PROPOSED STRUCTURE FOR A MARINE CDR SUBGROUP WITHIN THE CARBON REMOVAL EXPERT GROUP

Composition

SUB-EXPERT GROUP

Chair
DG CLIMA

Members
DG RTD, DG MARE, DG ENV, CINEA
mCDR experts
MRV specialists
Member State representatives
NGOs
Industry representatives

SECRETARIAT

Contracted consultants

Core mandate

SUB-EXPERT GROUP

- Periodically assess the state of the science along with conditions for responsible development and potential certification
- Identify and map the open scientific questions that block the development of methods
- Develop and maintain a structured mCDR R&I agenda and priorities
- Coordinate stakeholder input

SECRETARIAT

- Report to the Expert Group
- Help prepare Expert Group meetings and outputs, handles operational work, tracks progress against R&I priorities.

Outputs

EXPERT GROUP

- An annual readiness report reviewing progress on the key research questions and estimating remaining work needed before responsible deployment can be envisaged
- A biennial certification readiness assessment
- Formal recommendations to DG RTD and CINEA on research priorities.

THE ENTITY COULD BE SET UP AND WORKING WITHIN A FEW MONTHS

MONTH 0
- DG CLIMA initiates subgroup formation
- Expert nominations opened
- Secretariat procurement launched

MONTH 2–4
- Secretariat provider awarded
- Subgroup formed; first meeting held

MONTH 4–8
- First knowledge gap report scoped
- Initial R&I agenda drafted

THE STRUCTURE OFFERS CLEAR BENEFITS, AND CONSTRAINTS CAN BE MITIGATED

Fast to establish
Operational in 3–8 months under DG CLIMA's existing authority. No new legal act or legislative timeline.

Low cost
Expected low cost for the Secretariat. Expert participation draws on the existing CDR community.

Within DG CLIMA's mandate
Sits under the Carbon Removal Expert Group, chaired by DG CLIMA, with DG RTD, DG MARE, DG ENV and CINEA (ideally) represented.

Designed to evolve
This structure is a first step. It can evolve with time into, for example, a consortium project under the next Framework Programme.

Cannot bind outcomes
Expert groups carry no legal force.
Mitigation: include mid-review goals within the political mandate, triggering the need for periodic readiness assessments and progress reports.

Cannot direct EU funding
The sub-group recommends priorities to DG RTD and CINEA but cannot allocate resources.
Mitigation: formal written recommendations tracked as outputs and reported to the Commission.

Depends on political will
Outputs only matter if the Commission acts on them.
Mitigation: a political commitment from the Commission to evaluate certification creates a mandate to do so.

PILLAR II: A COORDINATED RESEARCH AGENDA

Critical scientific questions remain open for mCDR, including environmental impacts, MRV, and scalability. EU research and innovation funding remains **fragmented and insufficient** to address these challenges in a timely manner. The challenge is not simply generating more research; it is aligning the ecosystem around the questions that matter most for the responsible development of these methods, and, where relevant, their certification to efficiently use the funding available. Without a more coordinated R&I framework, the EU risks falling behind in generating the evidence base needed to develop these methods.

What stands in the way of addressing the remaining knowledge gaps?

- **Certification readiness is not clearly defined.** There is insufficient agreement, within the Commission and within the scientific community, on which scientific questions must be resolved to support certification and to what standard (or what is "good enough").

- **Research efforts are fragmented.** The EU has funded mCDR-relevant research, and several significant ongoing projects will generate findings key to addressing priority research questions. But without a shared view of priorities, the Commission, researchers, and project developers struggle to coordinate around the same evidence gaps and to secure progress towards shared research objectives.

- **Funding is dispersed and insufficient.** The absence of a common roadmap makes it difficult to direct and coordinate funding toward the highest-priority research needs, and ongoing projects and funding are not sufficient to address all gaps.

What is the role of an mCDR research agenda?

A marine CDR research agenda needs to ensure six things:

- **Define the key research gaps** that remain for each mCDR method and how they should be addressed across the time horizon.

- **Survey the current project landscape** by mapping which knowledge gaps ongoing EU-funded and private projects are already addressing to identify what is not being covered.

- **Close the coordination gap** by looking at where ongoing projects can contribute to priority research questions, including those relevant to certification, direct and synthesise their findings accordingly. This mapping requires active coordination.

- **Lay out a plan to address outstanding gaps.** For questions not covered by ongoing projects, identify the funding mechanisms, institutions and timelines required — across both the short-term and long-term horizon.

- **Direct sufficient funding** towards answering the most pressing questions.

- **Mobilise private investment** by de-risking the transition from laboratory research to controlled field trials and demonstration.





The following is a (non-exhaustive) list[1] of research and innovation priorities focused around OAE and DOCCS given the Commission's process on the CRCF – and created with a group of ~30 organisations representing the mCDR ecosystem (academics, civil society organisations, project developers). The majority of these questions are cross-cutting to the rest of the family of novel mCDR methods. The list lays out the questions that remain open and warrant further evidence before a full certification can be reconsidered.

Table 1: Research priorities for Ocean Alkalinity Enhancement & Direct Ocean Capture

Knowledge gap	Objectives
Quantification	
Improve quantification of ocean carbon removals and develop reliable, standardised, and transparent MRV systems for mCDR, including reducing uncertainty in key processes such as air–sea CO_2 flux and validating models through coordinated in-situ measurements.	Improve models and measurement options to bring the uncertainty in predicting and measuring the CO_2 uptake by alkalinity enriched or CO_2 depleted waters, down to levels compatible with the Q.U.A.L.I.T.Y criteria for certification under the Carbon Removals and Carbon Farming (CRCF) regulation.
Improve the understanding and quantification of processes affecting OAE/DOCCS efficiency, including mineral dissolution, secondary precipitation and carbonate system responses.	Increase understanding and prediction power (to levels of precision relevant to certification) on the impacts of chemistry alteration on the efficiency of the CDR process in a variety of conditions.
Develop methodologies to define baselines reflecting local specificities while preserving comparability and evaluate implications in terms of the need for regular independent ocean monitoring systems.	Enable robust and comparable quantification of additional carbon removal by establishing fit-for-purpose baselines that account for local variability and support certification requirements.
Determine the sensitivity of project level removals calculation to assumed atmospheric CO_2 concentrations and develop best practices for certification frameworks where expected and observed concentrations mismatch.	Reduce uncertainty in credit issuance by establishing how certification frameworks account for variability in modelled CO_2 removal linked to atmospheric CO_2 changes.
Understand and quantify potential indirect impacts on biogeochemical cycles that could result in reversals or reduction in natural uptake of atmospheric CO_2.	Define conditions in which the implementation of OAE could indirectly tamper with natural biogeochemical processes (including in remote areas) and result in reduced natural uptake of CO_2 or reversals.
Sustainability	
Evaluate benefits beyond carbon of OAE and DOCCS on ecosystems (e.g., mitigating acidity, fertilisation) and document conditions required for those benefits to materialise at significant levels.	Provide an evidence base to determine when and where ecosystem co-benefits of OAE and DOCCS are significant and can be credibly considered in deployment and certification.
Evaluate the negative impacts of OAE and DOCCS on ecosystems (e.g. toxicity, reduced productivity due to altered conditions, and mechanical effects such as impingement/entrainment or burial) and document conditions required for those impacts to remain below significance.	Characterise and quantify impacts of OAE on ecosystems, both chemical/toxicological and mechanical/physical, under conditions relevant to ongoing and planned field trials. Define safe thresholds (compared to baseline) for variables like pH, alkalinity, turbidity, and heavy metal concentrations.
Governance & local impacts	
Develop coherent governance and legal frameworks for mCDR research and deployment.	Provide legal clarity and governance coherence to support responsible mCDR research and deployment across international, EU, national, and regional levels.
Codify appropriate use cases and associated liability mechanisms for carbon removal certificates according to method maturity and uncertainty levels.	Develop standardised, science-based practice for registries to differentiate how carbon removal certificates from lower-maturity methods (such as OAE and DOCCS) may be used, and to define the liability mechanisms associated with each use case, so that certification reflects the uncertainty in a method's efficiency and permanence.

[1] This list is the result of Carbon Gap's analysis and the input of the European Marine CDR Working Group chaired by Carbon Gap, composed of 32 organisations ranging from civil society, to companies, to academics and the scientific community. For access to the full database, please visit this link.

The policy momentum and how to make it happen

With the next EU budget and Framework Programme for R&I due to start in 2028, alongside the forthcoming EU Ocean and Water R&I Strategy, the current political cycle offers a rare, once-in-seven-year opportunity to strengthen support for marine CDR.

Unless mCDR is explicitly included and strategically prioritised within these emerging frameworks, OAE and DOCCS risk lacking the support needed to advance their responsible development, address remaining scientific uncertainties and, where relevant, progress towards certification under the CRCF.

The CRCF, the next Framework Programme, and the EU Ocean and Water R&I Strategy should work in a **mutually reinforcing way**. The CRCF process can help identify remaining open questions relevant to certification, while EU R&I can support research to address these gaps, alongside questions concerning the development of methods.

The Ocean and Water R&I Strategy can play a key role by **explicitly including** mCDR within its scope and signal the need for a dedicated marine CDR research and innovation agenda that informs the next Horizon Europe and national funding schemes.

Action is needed across two different time horizons. In the short term, funding opportunities before the start of the next Framework Programme in 2028 are more constrained as the current Horizon Europe cycle approaches its end. In parallel, the priorities of the next Framework Programme are being shaped now.

A research agenda is the thread connecting these two time-horizons: it can ensure both short-term instruments and the forthcoming Framework Programme are systematically directed towards the questions that matter most. The table below outlines the actions needed across both horizons, and the roles of the different actors.

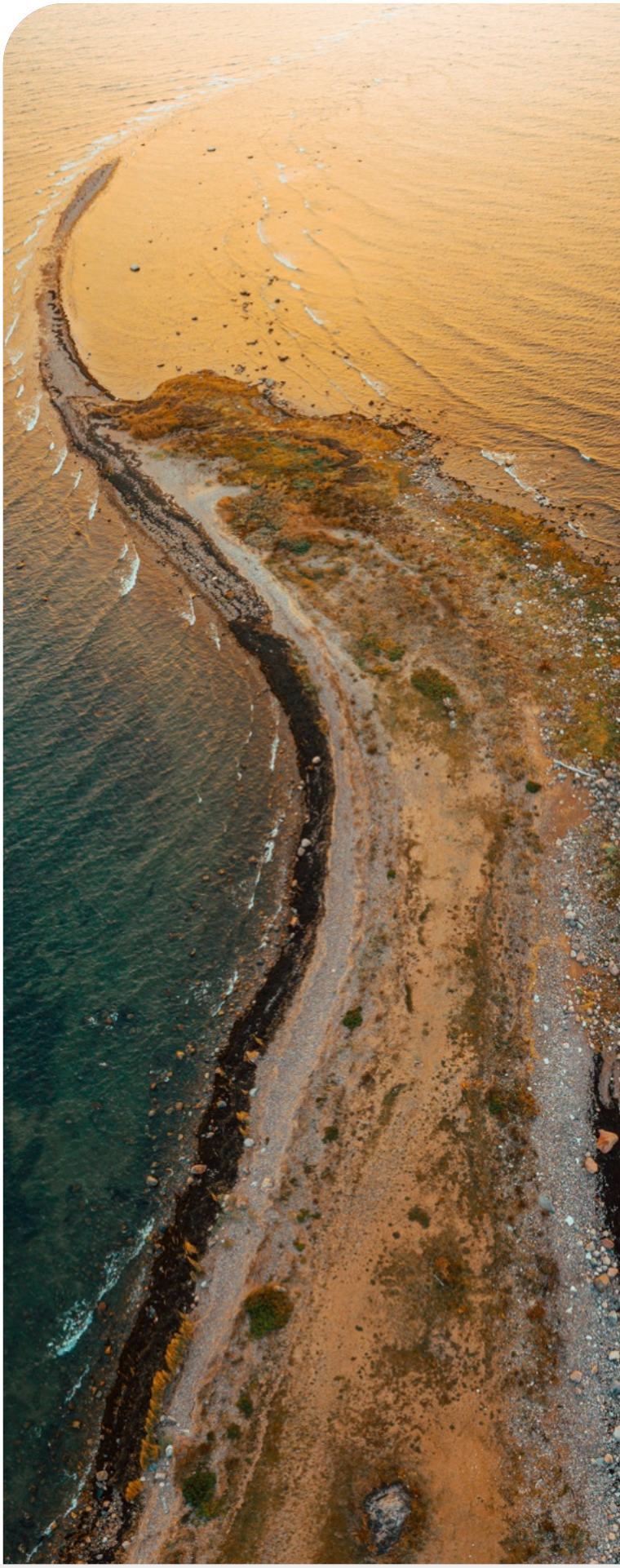


Table 2: Two horizons, one plan: short-term action and long-term shaping must be pursued in parallel

	Now — 2027 (Today)	FP10 onwards (2028)
Available instruments	• Remaining Horizon Europe call • LIFE programme • EIC Challenge • Member State funding • Private sector and research institution funding.	• Framework Programme 10 (FP10) • Member State funding • Continued private and philanthropic capital.
What the Commission must do	• Use a coordination mechanism, potentially through the proposed mCDR subgroup, to periodically assess the state of the science and identify priority research needs, drawing on ongoing projects and the scientific community • Ensure that remaining EU calls explicitly prioritise mCDR and certification-relevant questions. This requires DG CLIMA to engage actively with DG RTD and CINEA on call design and project selection. • Draw on existing mCDR projects to build awareness, expertise, and institutional support for mCDR within the Commission.	• Shape FP10 and the Ocean R&I Strategy now to ensure they reflect mCDR priorities. • Adopt a formal mCDR research agenda by, for example, funding mCDR coordination and support action under the next Horizon European call similar to the CREDIBLE project.
What the research community and private sector must do	• Step in to fund and coordinate research that EU instruments cannot reach in this window. • Align ongoing research projects with priorities identified in the shared agenda.	• Mobilise private capital to complement public funding under FP10. • Use the shared research agenda to identify which research questions are best suited to public funding and which to private investment, and make this distinction clear to both communities.
What Member States must do	• Include marine CDR in national research agendas. • Direct funding towards national research projects	• Develop mCDR national strategies • Include mCDR in forthcoming updates of the NECPs (National Energy and Climate Plans). • Continue funding research at a national level
Constraints	*No new Horizon Europe work programmes are available before 2028. Without immediate action on remaining instruments and calls, the short-term horizon closes with key gaps unaddressed.*	*FP10 structure and call priorities are being shaped now. If mCDR is not positioned as a priority in that process, the long-term horizon will be as underfunded as the short-term one.*

PILLAR III: COORDINATION WITH BROADER OCEAN GOVERNANCE

At EU level

Marine CDR is a new policy topic sitting at the intersection of climate, research and innovation, and marine and biodiversity policy. These policy areas cannot work in isolation from the broader EU ocean governance.

First, **a responsible development will depend on access to the data, modelling, and monitoring capacities** needed to quantify removals, assess potential environmental impacts and build credible baselines. As the EU strengthens its ocean observation capacity, including through the European Ocean Observing System and the OceanEye, it should explicitly support the evidence needs of mCDR research and, where appropriate, the development of certification methodologies under the Carbon Removals and Carbon Farming Regulation (CRCF).

Second, there **is limited clarity at EU level on how some engineered mCDR approaches should be governed**. Existing EU legislation on marine environmental protection and maritime activities was not designed with novel mCDR approaches in mind, creating uncertainty around how research activities and field trials should be assessed and permitted. Forthcoming initiatives offer an opportunity to address these gaps. The **Ocean Act** should list mCDR as a priority topic and signal the need for a coherent framework for the research, assessment, and potential future deployment, including the importance of clear responsibilities, permitting procedures and environmental safeguards. In tandem, the EU Ocean and Water R&I Strategy should help generate the necessary scientific evidence, supported by the data and monitoring infrastructure developed through **OceanEye**.

Third, better policy coordination also requires **stronger collaboration within the Commission**. Issues pertaining to mCDR sit across multiple Directorates-General. Climate policy and the CRCF sit primarily with DG CLIMA; DG RTD is responsible for R&I policy and DG MARE leads on many aspects of EU ocean governance and marine policy. A potential mCDR sub-group of the Commission CDR Expert Group could serve as a forum to ensure regular exchanges between those units, connecting the certification process to both research programming and the broader ocean policy framework.

For mCDR, coordination is therefore not an additional governance layer, but rather about bridging the gaps between research, certification, ocean observation and marine policy to establish a coherent framework.

At Member State level

Member States play a substantial role in funding mCDR research and generating context-specific evidence. Through clear national rules and permitting, they also have the role of creating the enabling conditions for field research and if appropriate, demonstration and deployment.

National R&I programmes are important not only because they increase funding for mCDR research, but also because much of the evidence needed to assess these approaches is **context-specific**. Environmental impacts, monitoring requirements and feasibility can vary across marine environments. Member States are therefore well placed to support research into whether, where and under what conditions different mCDR approaches could be safe and viable in their waters. These programmes also help build national expertise that governments can draw on to inform policy and decision-making.

Germany's CDRmare research mission is a flagship example of the role national funding can play in advancing mCDR research. Coordinated by the German Marine Research Alliance (DAM), it brings together nearly 140 scientists across six research consortia to investigate the ocean's potential for atmospheric CO_2 removal and storage.

Member States also play an important role in enabling responsible field testing of mCDR approaches. Even when research is funded at EU level, projects must navigate national regulatory and permitting frameworks. Clear procedures and guidance can help researchers and early-stage companies conduct field trials while ensuring appropriate environmental safeguards are in place.

EU and national action should therefore be mutually reinforcing - EU-level coordination can provide common research priorities and strategic direction, while Member States can fund context-specific research, enable responsible experimentation, and generate the evidence needed to inform both national decisions and EU-level policy development.

PILLAR IV: A POLITICAL COMMITMENT

A formal commitment to monitor and coordinate the research efforts on mCDR and create milestones strengthen confidence and visibility for mCDR actors. Without a signal that the EU wants to explore viable mCDR methods, investment, research and momentum drain away. This scenario should be avoided at all costs; time lost will not be recovered in time for net-zero. Such commitment should include structured process with regular meetings of an organizing and coordinating body to assess the progress as explored in Pillar I.

This commitment could also include a formal process to explore a non-crediting pilot or "trial certification." This exercise would select projects to test certification criteria while **not issuing any types of credits**. By testing how existing CRCF criteria would apply to novel mCDR methods in practice, such an exercise could help understand which criteria can already be met, where uncertainties remain, and what additional evidence is needed. It could also help identify practical challenges and **unanticipated constraints**. The findings could, in turn, inform the tactical research agenda (see Pillar II).

The Commission could deliver this commitment through different, non-mutually exclusive routes: **(1) leading with action** by taking visible steps towards advancing knowledge gaps, such as supporting the adoption of a research agenda (see Pillar II) or considering a "trial" certification; **(2) the upcoming CRCF revision**, by laying out provisions on how the CRCF should approach the certification of earlier-stage methods; **(3) a delegated act**, by addressing pathways to certification of earlier-stage methods.





TAKEAWAYS AND RECOMMENDATIONS

Novel mCDR methods are at a critical stage in their innovation trajectory - the basic principles are understood, some field scale trials have already been conducted, and significant progress has been achieved in recent years in narrowing down the conditions for safe deployment. Novel mCDR therefore represents an important opportunity to diversify Europe's CDR portfolio.

Yet, more work is still needed to reduce uncertainties around efficiency, safety, and scalability before considering deployment at scale. Novel mCDR is also a new policy area at risk of falling through the cracks of existing EU regulatory frameworks.

The EU can play a key role in addressing these challenges by improving research coordination, transparency, and awareness. However, the lack of a clear institutional home for novel mCDR limits its ability to do so. A dedicated coordination and oversight entity could help fill this gap by providing strategic direction, connecting relevant actors and tracking progress.

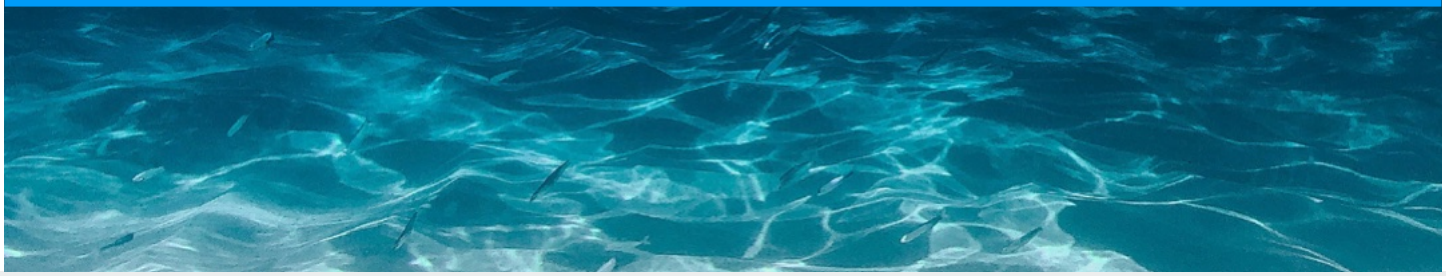
The CRCF certification framework can be a useful compass to align research efforts with key outstanding questions. Conducting non-crediting or "test certification" exercises could help identify practical challenges and build experience that could inform the process when the EU is ready to reconsider a full certification.

A more coordinated EU approach would also help better leverage private investment and ongoing research efforts. Clear communication of the EU's objectives for novel mCDR, alongside defined ownership, a structured process and clear milestones for reassessing progress, would help maintain momentum. Targeted funding and greater coordination with Member States on permitting frameworks could also facilitate field trials and data sharing.

Research, innovation and certification policy need to work in a mutually reinforcing way. A shared research agenda should help identify the scientific uncertainties that limit the development of these methods and, where relevant, their certification. The remaining 2026–27 funding period must be used effectively, while the next Framework Programme and EU Ocean and Water R&I Strategy should consider mCDR a research priority.

Marine CDR cannot be advanced through climate policy alone. R&I programming, certification, ocean observation, marine governance and Member State action need to evolve together to build the evidence needed for responsible development and potential future deployment.

The EU is uniquely positioned to take the lead on setting the standard practice for developing and deploying novel mCDR responsibly. Making progress on these methods is also in the EU's interest to further diversify its CDR portfolio, mitigating the pressure on other CDR methods and associated resources. More broadly, novel mCDR offers a valuable learning opportunity for the EU, generating lessons that could inform its approach to other emerging CDR methods that are not yet ready for certification.



ABOUT US

Carbon Gap is the leading independent not-for-profit focused exclusively on carbon dioxide removal (CDR) policy in Europe. We are entirely philanthropically funded allowing us to deliver impact on behalf of the planet.

With a team based across Europe, we bring together a unique combination of technical CDR expertise, deep political connections, advocacy tradecraft, and strong policy design capabilities. We effect change by working closely with key policymakers as trusted advisors, building CDR support amongst elected politicians, and sharing intelligence with the CDR ecosystem via action-oriented tools and reports.

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