



Achieving climate neutrality and the Paris Agreement goals: Opportunities for ocean-based methods of carbon dioxide removal (CDR)



Tuesday 25 October 2022, 12:00 – 14:00 CEST
European Parliament, Brussels, Room: ASP 5G1 / online

**Hybrid event co-hosted by MEP Maria da Graça Carvalho & MEP
Catherine Chabaud**

Moderator:

Minna Epps, Head of IUCN Ocean team

Speakers:

- **MEP Maria Carvalho**
- **Dr. David Keller**, OceanNETs & CDRmare, GEOMAR Helmholtz Center for Ocean Research Kiel, Germany, IOW, Germany
- **Prof. Dr. Alexander Proelß**, OceanNETs & CDRmare, University of Hamburg, Germany
- **Rodrigo Ataide**, Policy Officer, A1 Unit on “Maritime Innovation, Marine Knowledge and Investment”, DG MARE, European Commission
- **Alexa Mayer-Bosse**, Senior Manager Business Development & Origination, Agro & Weather Risks, Munich Re
- **Dr. Antonia Leroy**, Head of Ocean Policy, WWF European Policy Office
- **Dr. Samantha Eleanor Tanzer**, CDR Research & Technology Manager, BELLONA
- **Prof. Dr. Andreas Oschlies**, CDRmare & OceanNETs, GEOMAR Helmholtz Center for Ocean Research Kiel, Germany
- **Dr. Prof. Laurent Bopp**, Research Director, CNRS
- **MEP Barry Andrews**
- **MEP Catherine Chabaud**

Welcome Remarks

MEP Maria Carvalho

“The question is not to make the carbon an evil, but it is us, we should know how to deal with carbon, and the proper way should be to have a cycle approach to it”

MEP Ms. Carvalho highlighted the importance of establishing **negative emissions technologies** to achieve climate neutrality. However, as she discussed, such technologies are still not completely available to use as they are currently being researched. In this regard, Ms. Carvalho invited the participants to look for **available European Union funds** to find solutions and finance research. Furthermore, she stressed the fundamental role played by the **carbon cycle** in mitigating climate change. She explained that some of the available technologies capture the carbon to reuse it, so that it can be released in the atmosphere and captured once again. The problem is that, first, most of these technologies are **land-based**, and second, there are land use restrictions currently being implemented which are – indirectly blocking the use of such technologies. For this reason, Ms. Carvalho pushes research to focus more on the technologies offered by the ocean to keep the carbon in balance, given that such ecosystems are fundamental for maintaining the **equilibrium of the Co2** on the planet. Additionally, the MEP also stated that **better data as well as more advanced knowledge and research** are needed to create a legal and political **framework** capable of promoting carbon dioxide removal technologies. In the same way, she believes that transparent and effective **communication** from politicians directly to the public must be carried out, and that science and policy work should integrate and complement one another.

Panel discussion

Dr. David Keller, OceanNETs & CDRmare, GEOMAR Helmholtz Center for Ocean Research Kiel, Germany, IOW, Germany

“We all know that to meet the Paris Agreement we have to reduce emissions, that is the primary thing we must do, but this is not going to be enough”

Dr. David Keller provided the audience with an overview of ocean-based carbon dioxide removal as well as negative emissions technologies. In his presentation, Mr. Keller supported

the idea that **carbon dioxide removal is a necessary element** of the mitigation portfolio to achieve net zero emissions or to remove excess Co₂. Moreover, he also agreed with MEP Ms. Carvalho on the fact that mostly land-based approaches for carbon dioxide removal have been discussed and developed in research so far. In this regard Dr. Keller added that, compared to land, the ocean covers most of the earth surface, which means it provides enough area and less competition for space compared to land. Additionally, he also stated that, as oceans can store the carbon, ocean carbon dioxide removal can also be considered an effective method to **accelerate the carbon cycle**. Dr. Keller presented and accurately explained the main ocean **carbon dioxide removal approaches**, namely alkalisation, ocean fertilisation, blue carbon sinking enhancement, growing of marine biomass, direct Co₂ removal from seawater with carbon capture and storage (CCS), artificial upwelling and downwelling, and dumping marine biomass in the deep ocean. He concluded by mentioning that these methods are still purely theoretical, and research is mostly focused on their side effects and economic feasibility, with only a few lab studies providing dense practical information. However, Mr. Keller also confirmed that increasingly **more experiments** are being carried out on carbon dioxide removal methods as well as more realistic modelling simulations, and better economic analysis. To answer the overall question of this event, i.e., “can ocean-based carbon dioxide removal contribute to realistic and desirable pathways to achieve Paris agreement goals?”, Dr. Keller replied that, despite ongoing scientific research, **it is still unknown whether costs and side effects** might be desirable.

Prof. Dr. Alexander Proelß, OceanNETs & CDRmare, University of Hamburg, Germany

“Ocean-based CDR is a very complex issue also from the perspective of law and governance”

Dr. Proelß illustrated how ocean-based carbon dioxide removal technologies’ activities conducted within the marine environment have specific **legal consequences**. He began by discussing the limitations and considerations of the international law of the sea. He first mentioned the **United Nations Convention on the Law of the Sea (UNCLOS)** described by him as the “constitution for the oceans” setting limits for member states on their activities related to the marine environment. Dr. Proelß further introduced the **Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972**, and the **London**

Protocol, 1996 administered by the International Maritime Organisation. The reason why he focused on the latter is that **2013 Amendment** on the London protocol with regards to marine engineering is the first amendment with potentially binding international regulations regarding ocean-based carbon dioxide removal. Dr. Proelß clarified that the amendment has **not passed into force yet**, as the total number required for ratification still needs to be achieved. However, he emphasised that this regime can be considered as a **model** for other regimes concerning activities related to ocean-based carbon dioxide removal. He explained that the 2013 amendment mentions only one ocean-based carbon dioxide removal approach (i.e., ocean fertilisation) while all the other marine activities cannot be researched so far. As he continued with his analysis, Dr. Proelß stated that this amendment refers to what has been called **legitimate scientific research**, which poses research on ocean-based carbon dioxide removal as its focus, and it is therefore something not applicable to commercial activities. Shifting from legislation to governance of ocean-based carbon dioxide removal approaches, Dr. Proelß concluded by underlining few of the **challenges** arising in the international arena concerning ocean-based carbon dioxide removal activities and legislation. Some of them include nominating a competent fora in charge of decision-making regarding scientific projects on ocean-based carbon dioxide removal and enshrining how collision between different regimes can be avoided or else how transparency can be ensured, and future generations as well as local communities can be included in such projects.

Rodrigo Ataide, Policy Officer, A1 Unit on “Maritime Innovation, Marine Knowledge and Investment”, DG MARE, European Commission

“There is the need to assess the environmental, technical, economic, social feasibility and side effects of Co2 removals”

Mr. Ataide emphasized that reducing GHG emissions is a priority for organising human lives on earth. In this regard, he mentioned that the main targets for the European Commission concern reaching **net zero emissions GHG by 2050** and **reducing them by 55%** - compared to 1990 levels - **by 2030**. Mr. Ataide also affirmed that he actively engages with and supports the EU international partners on climate action, particularly through the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. Furthermore, Mr. Ataide agreed that **Co2 removal is necessary to counterbalance emissions** if net zero Co2 and net zero GHGs are to be achieved, and that the **ocean**, as an inherent part of the global

carbon cycle, may offer **opportunities for increasing Co2 removal**. Finally, he also articulated that the use of oceans as carbon dioxide removal pools depends on their **feasibility, sustainability, and associated risks** at large scale. Overall, Mr. Ataide concluded that the updated European Union international ocean governance agenda from June 2022 acknowledges that there is an **increasing interest in ocean-based carbon dioxide removal methods**, and that **the European Union is committed to improve** quantification of carbon and storage within marine ecosystems.

Alexa Mayer-Bosse, Head of Business Development & Origination, Agro & Weather Risks, Munich Re

“We have interests to work and support climate action because we are paying the consequences with natural catastrophes”

Ms. Alexa Mayer-Bosse affirmed that the climate agreement can be reached and that Munich Re unites all their efforts to **support the transition towards a low carbon economy** in line with that goal. Munich Re as a world leading reinsurer is committed to this goal through both sides of its balance sheet: the **liability side (insurance) and the asset side (investment)**. Ms. Mayer-Bosse illustrated her point by taking the case of a **nature-based carbon market**. She stated that, to establish market carbon dioxide removal solutions, it is a priority to **find an investor** interested in making sustainable investments. To attract investors, the **revenue stream** of such investment (i.e., the return of that investment) must be identified as investors want to monetize their investments. Indeed, she explained that generated carbon certificates based on Co2 tonnes sequestered or removed would both establish the revenue stream and assure climate action. By creating effective carbon certificate markets, sustainability investors can be attracted to scale low carbon economy. She therefore concluded that the **monitoring and evaluation** to guarantee and produce such carbon sink on a tonne basis must be established. **Insurance as risk assessment methodology** can assist to perform monitoring and evaluation also on a monetary basis.

Dr. Antonia Leroy, Head of Ocean Policy, WWF European Policy Office

“The climate crisis can be tackled together”

Dr. Antonia Leroy began her contribution to this event by affirming that **climate crisis** and **biodiversity crisis** are **intertwined** and need to be dealt with **together**. In fact, she mentioned the double effect produced by ocean-based CDR technologies, showing that there is both a **high financial and social benefit** in restoring ecosystems in terms of carbon. She recommended research to look at **nature-based solutions** in terms of habitats and species restoration to find the side effects of carbon dioxide removal techniques. Not only in research, but Dr. Leroy stated that the marine habitat and its species have been significantly left out from **green regulations** too, and that it is key to focus on those to meet the Paris Agreement goals. In this regard, she pointed to the **Maritime Spatial Planning tool** – coming from the Maritime Spatial Planning Directive – something which members had often failed to deliver on time or in an efficient manner. Dr. Leroy concluded by suggesting that a combination of the different stakeholders’ backgrounds and expertise should be pushed forward to **jointly tackle the climate crisis**.

Dr. Samantha Eleanor Tanzer, CDR Research & Technology Manager, BELLONA

“The successful scale up of carbon dioxide removal requires a systemic approach, tracking carbon from source to sink, and continually checking in with new scientific knowledge”

Dr. Samantha Eleanor Tanzer emphasises the urgency to tackle climate change mitigation, and that CDR is considered the new way of commercialisation development. Moreover, as ocean-based CDR is considerably new, Dr. Tanzer stressed how relevant it is to have such conversation involving academic researchers regarding **new potential pathways to explore**. Indeed, she believes that there is not only one way forward, and that surely there will be back and forth conversations regarding CDR methods where **engagement with the academic community** will be pivotal to understand the possible **risks of scaling up**.

Prof. Dr. Andreas Oschlies, CDRmare & OceanNETs, GEOMAR Helmholtz Center for Ocean Research Kiel, Germany

“We cannot reduce all emissions to zero in the next few decades, to compensate for this we need carbon dioxide removal technologies”

Prof. Dr. Oschlies expressed concern regarding the climate issues related to the current levels of oceans oxygenation, and he claimed that stopping global warming by reaching net zero

emissions **can stop ocean oxygenation** at least on surface water. However, he also affirmed that reducing all emissions to zero in the next decade is almost impossible and **compensating with carbon dioxide removal technologies is essential**. Additionally, Dr. Oschlies agreed that there are significant ecological and humanitarian side effects of land-based carbon dioxide removal and, therefore, **oceans' side effects would be more tolerable**. The European Union – he continued – has the responsibility to lead by example by setting up a **transparent and responsible carbon system** in Europe. Dr. Oschlies explained how oceans-based carbon dioxide removal technologies are currently at a **disadvantageous** position compared to land-based ones as for any ocean-based restoration project carbon credits cannot be issued, yet. For this reason, he emphasized that the role of the European Union is also fundamental for what concerns assuring that land-based and ocean-based carbon dioxide removal technologies have the same treatment. To conclude, Dr. Oschlies invited the European Union to **boost public fundings for research, transparency** regarding those research projects, as well as keeping biodiversity and climate issues up on the agenda.

Dr. Prof. Laurent Bopp, Research Director, CNRS

“Models are essential tools to help monitor report and verify the ocean-based carbon dioxide removal techniques”

Dr. Prof. Laurent Bopp believes that it is also science's responsibility to contribute by carrying out extensive research, by ensuring that any proposed solution is properly **tested**, effectiveness is accurately **evaluated**, and side effects are **explored** and **solved**. He described the ocean as an extremely **complex** environment, where carbon is stored in different forms, and it is moved across great distances as it is carried by the sea currents. This challenging complexity is also faced when it comes to monitoring and evaluating the sequestered ocean-based carbon. In this regard, Dr. Bopp affirmed that **models** are essential tools to help to monitor report and verify the ocean-based carbon dioxide removal techniques. In fact – he argued – models give the opportunity to create counterfactual worlds where you can and cannot apply the technologies and, in so doing, allow scientists to **determine the effectiveness** of a given method and to precisely test it while also **identifying its possible side effects**. Dr. Bopp concluded by affirming that a **variety and diversity of models** developed independently is necessary to better monitor, report, and verify the ocean-based carbon dioxide removal techniques.

MEP Barry Andrews

“There are scientific, economic, political, and legal challenges to ocean-based CDR”

MEP Mr. Barry Andrews agreed that the benefits flowing from ocean-based carbon dioxide removal will be successful for everyone and, therefore, **incentives for investments** in this space must be provided to meet the ambitious targets. He added that the **insurance industry** has an inherent interest in insuring that there is success in this area, both for the social value of reducing emissions, and also the economic one of reducing claims on the industry. Moreover, MEP Mr. Andrews affirmed that the idea of sharing value must be part of the conversation, especially regarding the examination of possible **side-effects** and whether there might be **trade-offs** to regimes coalition.

MEP Catherine Chabaud

“We have to change the paradigm: we must not only think about how to reduce our impact on oceans but also how the activities could positively impact in this topic of carbon dioxide removal”

MEP Ms. Catherine Chabaud affirmed that, given that the ocean is a global common, every human being is responsible both individually and collectively to **protect** it. MEP Ms. Chabaud believes that the **International Panel for Ocean and Sustainability** should be one of the fora where science should and could work on this topic, while also providing reports to the other stakeholders and politics. She also shared that, in a resolution recently voted upon in the European Parliament, she promoted to include the **blue carbon in climate and biodiversity** technology and that **solutions for better monitoring** must be pushed forward. Finally, MEP Ms. Chabaud concluded by inviting the event’s participants to **think out of the box** when it comes to carbon dioxide removal technologies.

Q&A Session

On behalf of **Carbon Gap**, **Mr. Eli Mitchell-Larson** openly shared the same concerns the panellists agreed on regarding side-effects for ocean-based carbon dioxide removal. However, given the **urgency** to act due to ocean suffocation or deoxygenation as well as the short timeline to apply specific ocean-based carbon dioxide removal methods, his question pointed

to what members of civil society and NGOs can do to break down barriers which would make research go faster. He also specified that *“it might be easier to say more money and that would be the case, but what are the other elements necessary - such as human capital - or other barriers slowing down practical research which can get us answers on these go-or-no-go decisions and let these methods help the climate?”*. **Prof. Dr. Alexander Proelß** answered this question by clearly stating that increasing **full transparency** of all efforts is needed. Indeed, results reporting is necessary, not only of **successes** but especially of **failures**. To conclude, Dr. Proelß added that it is important to reach an **agreement concerning responsible research of ocean management systems**, as this would speed up the knowledge exchange process among different stakeholders.

Speakers also showed strong interest and willingness to continue the discussions around the topic of CDR in the future and the need for further information and awareness raising. Moreover, during the event it was shown that there are already 58 active companies focusing on ocean-based CDR and more needs to be done in terms of the precaution and discussion about the potential negative environmental impacts and the overall need to remain focus on cutting emissions.

Closing remarks

Dr. David Keller, OceanNETs & CDRmare, GEOMAR Helmholtz Center for Ocean Research Kiel, Germany, IOW, Germany

Dr. Keller expressed satisfaction concerning the variety of material shared by the different stakeholders during the event which perfectly depicted the multiple and intertwining dimensions of the issue at stake. In fact, he solicited academic researchers to work with policy makers, and in turn called for them to interface with members of NGOs and various stakeholders involved in ocean-based carbon dioxide removal methods. Dr. Keller concluded by remarking that regulations as well as better and more transparent communication is needed, and such must be brought up and worked on all together.