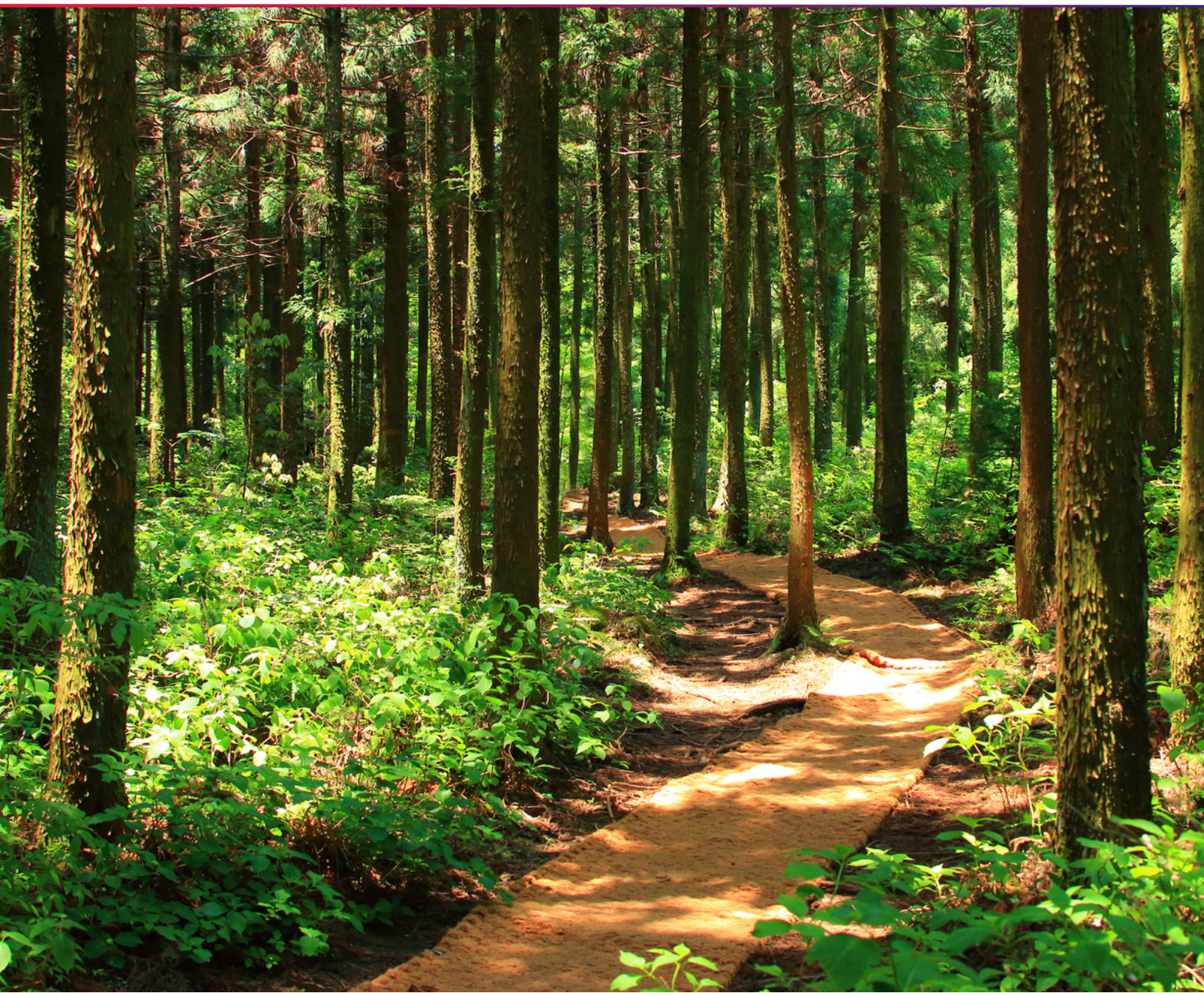


2023

END OF YEAR REPORT



About the Institute

Carbon removal, crucial for meeting climate targets, involves capturing and storing atmospheric CO₂ emissions. However, the Institute emphasizes that responsibly scaling carbon removal isn't solely about proving its feasibility; it necessitates considering societal impacts like socio-environmental consequences, potential benefits, stakeholder involvement, profit distribution, perpetuating emissions, and reinforcing inequalities. To ensure beneficial outcomes, regulations, practices, and institutions are vital. Presently, investment in carbon removal is rapidly growing, presenting challenges but also opportunities for a transformative shift in project development and inclusive decision-making. The Institute's mission is to develop equitable and ethical carbon removal strategies through research, policy shaping, governance facilitation, and educational initiatives. Operating as neutral academics, their unbiased assessments aim to influence decisions at all levels, prioritizing marginalized groups, and collaborating with diverse stakeholders for robust, rigorous outcomes.



A Look Back at Our History

The Institute traces its origins back to the Forum for Climate Engineering Assessment (FCEA), which is a 2013 initiative led by Simon Nicholson, Wil Burns, David Morrow, and Michael Thompson. FCEA aimed to assess the social, ethical, political, and legal implications of emerging technologies within climate engineering. The core mission involved producing policy-relevant research and commentary, ensuring the climate engineering discourse prioritizes justice, equity, agency, and inclusion. FCEA emerged from the acknowledgment that the discussion on climate engineering responses to climate change was rapidly gaining significance but remained narrowly focused in terms of actors and interests.

In 2018, it became clear that the conversations around carbon removal demanded to be put into their own unique category. Hence, the Institute for Carbon Removal Law and Policy was launched. In the subsequent years, the Institute has grown exponentially, expanded its objectives, and pulled together a number of impactful convening and workshops.

In 2019, the Institute organized a pivotal meeting at the Wingspread Center in Wisconsin, bringing together representatives from seventeen non-governmental organizations (NGOs) focused on climate change. Titled "Engaging the US Environmental Community in the Assessment of Carbon Removal," the meeting aimed to clarify the implications of the 1.5°C Paris target. Through expert presentations and discussions, the meeting initiated the identification of common approaches and metrics for assessing carbon removal technologies. Additionally, we established an ongoing network and conversation with the intent of evolving into a standing community of engagement. While a few NGOs had stances on carbon removal, many were still in the process of determining their positions. The meeting culminated in the formation of the Carbon Removal Working Group, which convened for nearly two years following the conclusion of the event.

In September 2022, the Institute convened a meeting at the Pocantico Center of the Rockefeller Brothers Fund in Tarrytown, New York. Themed "A New Direction for Civil Society Engagement with Carbon Removal," the gathering united participants from government, civil society, the private sector, Environmental Justice leaders, and academics. The discussions, centering on dynamic governance and policy issues related to carbon removal, proved highly productive. The meeting fostered the establishment of trust and relationships, overcoming previous challenges, and resulted in a work plan ensuring ongoing close collaboration among participants.

Early 2023 marked a significant moment as Dr. Sara Nawaz joined as the new Director of Research. An environmental social scientist, Sara focuses on designing just, equitable, and responsible carbon removal technologies and policies, involving diverse societal groups. She has significantly contributed to the field, producing academic publications, and articles, all of which are detailed throughout this report.

The summer of 2023 saw the launch of the Institute's inaugural Carbon Justice Fellows Program, co-convened with the National Wildlife Federation (NWF). This selective program engaged 11 professionals globally in a two-week exploration of equity and justice dimensions in carbon removal. Notably, Jake Ferrel, one of the fellows, who now has a role within NWF, has been guiding the fellows from their respective locations for a year of continued engagement. The fellows, representing diverse organizations and universities, underscore the Institute's commitment to fostering emerging leaders dedicated to justice and equity in carbon removal.

A New Era for the Institute

As of early 2024, the Institute is excited to share that we have embarked on a transformative journey, realigning our priorities and expanding our research areas. This significant evolution has led us to adopt a new name: Institute for Responsible Carbon Removal. Our current focus involves actively engaging in action-oriented research, influencing policy and governance, fostering open dialogues, contributing to frameworks and best practices, developing regulatory guidelines, and offering educational opportunities through fellowships, trainings, and workshops. As academically grounded and neutral actors, we are actively collaborating with diverse stakeholders to champion responsible, democratic, just, and equitable carbon removal.



Another big year for carbon removal

In 2023, the carbon dioxide removal (CDR) landscape witnessed substantial progress despite significant challenges. Both governmental and private sectors surged in investments, indicating wider acceptance of carbon removal technologies. Although political disruptions hindered the Farm Bill negotiations, stalling crucial funding for CDR initiatives, bipartisan collaboration ushered in key bills like the Advancing Research on Agricultural Climate Impacts (ARACI) Act and the Carbon Removal and Emissions Storage Technologies (CREST) Act.

Noteworthy milestones encompassed the Department of Energy's (DOE) selection of two megaton Direct Air Capture (DAC) Hubs from four, the initiation of collaborative sessions, and backing for diverse carbon removal endeavors via the Carbon Negative Shot initiative. A significant development was the government's commitment to a \$35 million CDR procurement pilot, indicating direct engagement in purchasing carbon removal. Other strides included initiatives focusing on responsible carbon management, biomass-based carbon removal guidelines, USDA's soil carbon monitoring strategy feedback solicitation, and funded projects by the National Oceanic and Atmospheric Administration related to ocean carbon removal strategy.

Major financial pledges from the \$1 billion Frontier fund and corporate giants like Amazon, Microsoft, and JP Morgan Chase were observed, coupled with substantial carbon removal deliveries by companies like Climeworks and Charm. Furthermore, the emergence of organizations like the Carbon Removal Alliance and Carbon Removal Canada emphasized a dedication to fostering equitable and ethical practices in carbon removal efforts. Additionally, amidst these advancements, the DOE's announcement of selecting two regional DAC hubs in Texas and Louisiana, alongside 19 preliminary development project awardees under the Bipartisan Infrastructure Law (BIL), marked a pivotal step. These initiatives, spanning various locations and technologies, aim to accelerate the commercialization of diverse DAC technologies capturing CO₂ from the atmosphere.

The DOE's allocation of up to \$1.2 billion from the available \$3.5 billion through the BIL is set to facilitate the conceptualization, design, construction, and operation of these DAC Hubs, enabling CO₂ storage in geological formations or their conversion into useful products.

What is carbon removal?

Carbon removal is the process of drawing carbon dioxide out of the atmosphere and locking it away in terrestrial, geological, or marine sinks or in long lived products for decades, centuries, or millennia or utilizing captured carbon for purposes such as the generation of energy, chemicals production, or to create high strength materials. The methods for doing so fall into three main camps: biological, geological, and carbon utilization. Carbon removal can also be referred to as carbon dioxide removal (CDR) or negative emissions technologies (NETs) or as one type of greenhouse gas removal (GGR).

For more, see our fact sheets and explainer materials: www.carbonremoval.info

Why does carbon removal matter?

As a supplement to reducing emissions, carbon removal has the potential to slow, reduce, and reverse the impacts of climate change. Carbon removal has now moved into mainstream and international climate change response discussions. However, there is still much uncertainty surrounding the technological feasibility and social implications of these approaches. In order to make responsible decisions about the use of carbon removal, these uncertainties must be clarified and critically assessed.

What is Sustainable Carbon Removal?

Sustainable carbon removal is carbon removal that meets the needs of the future without compromising the ability of current generations to meet their own needs. Read our report on sustainable carbon removal: bit.ly/sustainableCDR

2023 Accomplishments

Selected Publications

Buck, Holly Jean, Wim Carton, Jens Friis Lund, and Nils Markusson. “Countries’ Long-Term Climate Strategies Fail to Define Residual Emissions.” *Nature Climate Change* 13, no. 4 (2023): 317–19. <https://doi.org/10.1038/s41558-023-01614-7>.

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Burns, Wil. “Governance of Ocean-Based Carbon Dioxide Removal Research Under The United Nations Convention on The Law of The Sea.” *Maine Law Review* (2023). <https://bpb-us-e1.wpmucdn.com/sites.northwestern.edu/dist/6/6499/files/2023/02/UMaineLR-UNCLOS-MSR-mCDR.pdf>.

Cooley, Sarah R., Sonja Klinsky, **David R. Morrow**, and Terre Satterfield. “Sociotechnical Considerations About Ocean Carbon Dioxide Removal.” *Annual Review of Marine Science* 15, no. 1 (2023): 41–66. <https://doi.org/10.1146/annurev-marine-032122-113850>.

Cullenward, Danny, Grayson Badgley, and Freya Chay. “Carbon Offsets Are Incompatible with the Paris Agreement.” *One Earth* 6, no. 9 (September 15, 2023): 1085–88. <https://doi.org/10.1016/j.oneear.2023.08.014>.

Goldberg, David S., **Sara Nawaz**, James Lavin, and Angela L. Slagle. “Upscaling DAC Hubs with Wind Energy and CO₂ Mineral Storage: Considerations for Large-Scale Carbon Removal from the Atmosphere.” *Environmental Science & Technology* 57, no. 51 (December 26, 2023): 21527–34. <https://doi.org/10.1021/acs.est.3c03492>.

Lund, Jens Friis, Nils Markusson, Wim Carton, and **Holly Jean Buck**. “Net Zero and the Unexplored Politics of Residual Emissions.” *Energy Research & Social Science* 98 (2023): 103035. <https://doi.org/10.1016/j.erss.2023.103035>.

Nawaz, Sara, Javier Lezaun, Jose Maria Valenzuela, and Phil Renforth. “Broaden Research on Ocean Alkalinity Enhancement to Better Characterize Social Impacts.” *Environmental Science & Technology* 57, no. 24 (June 20, 2023): 8863–69. <https://doi.org/10.1021/acs.est.2c09595>.

Nawaz, Sara, Guillaume Peterson St-Laurent, and Terre Satterfield. “Public Evaluations of Four Approaches to Ocean-Based Carbon Dioxide Removal.” *Climate Policy*, February 24, 2023, 1–16. <https://doi.org/10.1080/14693062.2023.2179589>.

Nawaz, Sara, and Terre Satterfield. “Towards Just, Responsible, and Socially Viable Carbon Removal: Lessons from Offshore DACCS Research for Early-Stage Carbon Removal Projects.” *Environmental Science & Policy* 151 (January 1, 2024): 103633. <https://doi.org/10.1016/j.envsci.2023.103633>.

Nawaz, Sara, Celina Scott-Buechler, and Holly Caggiano. “An Independent Public Engagement Body Is Needed to Responsibly Scale Carbon Removal in the US.” *Environmental Research Letters* 19, no. 1 (December 2023): 011002. <https://doi.org/10.1088/1748-9326/ad1081>.

Satterfield, Terre, **Sara Nawaz**, and Miranda Boettcher. “Social Considerations and Best Practices to Apply to Engaging Publics on Ocean Alkalinity Enhancement.” *State of the Planet 2-oae2023* (November 27, 2023): 1–22. <https://doi.org/10.5194/sp-2-oae2023-11-2023>.

Satterfield, Terre, **Sara Nawaz**, and Guillaume Peterson St-Laurent. “Exploring Public Acceptability of Direct Air Carbon Capture with Storage: Climate Urgency, Moral Hazards and Perceptions of the ‘Whole versus the Parts.’” *Climatic Change* 176, no. 2 (2023): 1–21. https://ideas.repec.org/a/spr/climat/v176y2023i2d10.1007_s10584-023-03483-7.html

IFRCR in the Media

In February, *Illuminem* recognized Co-Director Wil Burns for his achievements in the article "[TOP 10 Most Read Thought Leaders in Climate Change](#)." This acknowledgment underscored his influence in shaping the climate change debate. Additionally, ICRLP's Director of Research, Sara Nawaz, contributed to the conversation by appearing on the "[Breaking! DAC & public opinion](#)," podcast by Reviewer 2 Does Geoengineering.

Wil continued to make significant contributions in March with his article "[Don't Rule out Enhanced Oil Recovery in Carbon Dioxide Removal Policymaking](#)," featured in *Illuminem*. Furthermore, ICRLP Fellow Danny Cullenward provided perspectives in a *Yahoo Finance* article titled "[Long-Awaited Rules for Carbon Offset Market Disappoint Experts](#)." Danny was also quoted in a *KQED* article titled "[Could Carbon Removal Be California's Next Big Boom Industry?](#)"

April featured Sara who was quoted in *The Verge's* article "[Why this new plant is capturing carbon dioxide just to let it back out again](#)." This piece addressed the challenges associated with direct air capture. Ben Rubin, another ICRLP Fellow, gained recognition in *The Guardian* with the article "[Carbon dioxide removal: the tech that is polarising climate science](#)," emphasizing the gigatonnes of carbon removal required. Holly Jean Beck, yet another ICRLP Fellow, shared insights in *Earth.com's* article "[Residual emissions must be addressed to reach net zero](#)." Danny's perspectives were captured in *The Sacramento Bee's* article "[SMUD wants to be carbon-free by 2030. Should it capture carbon and store it underground](#)." Additionally, *Inside Climate News* quoted Danny in the article "[Carbon Removal Projects Leap Forward With New Offset Deal. Will They Actually Help the Climate?](#)"

In May, Sara contributed an article to *Illuminem* titled "[Improving community engagement on carbon removal: initial reflections and recommendations](#)." Danny continued to make an impact, being featured in *MIT Technology Review's* article "Inside the little-known group setting the corporate climate agenda." Holly added her voice in *Dissent* with the article "The Carbon Capture Distraction."

In June, Holly continued her impactful contributions with an insightful article in *Noēma* titled "[The Extraordinary Green Promise Of A Tiny Molecule](#)." Delving into the potential of hydrogen produced by renewable energy, she explored the transformative role this molecule could play in a global shift toward a green economy. Her detailed analysis shed light on the extraordinary possibilities inherent in harnessing renewable energy for sustainable hydrogen production.

July brought forth an op-ed authored by Danny in *The Hill Times*, titled "[A cap on oil and gas emissions would make Canada's climate pledge credible.](#)" In this thought-provoking piece, he not only emphasized the necessity of capping emissions but also articulated how such a strategy is essential for bolstering Canada's credibility in meeting its climate commitments. His insights provided a compelling argument for stringent measures in addressing emissions from the oil and gas sector, contributing to the ongoing discourse on sustainable climate action.

August brought an article from Wil in *Illuminem* titled "[The Biodiversity Beyond National Jurisdiction Treaty and its Implications for marine-based carbon dioxide removal.](#)" This piece delved into the potential implications of a new landmark treaty on marine-based carbon dioxide removal.

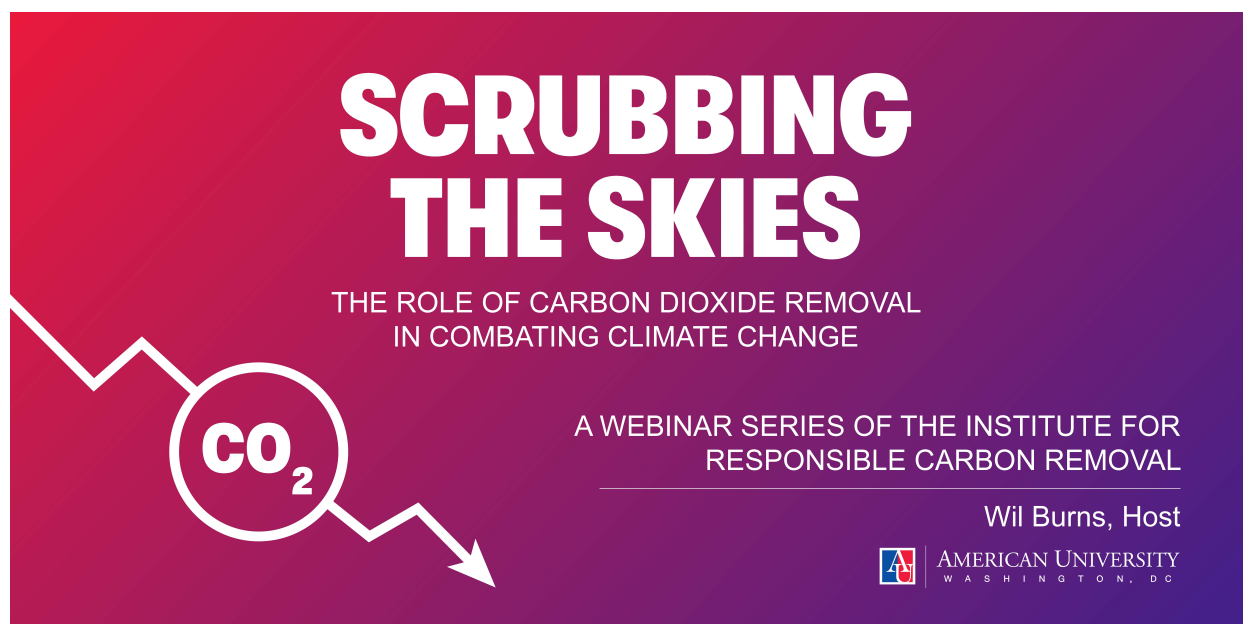
October featured Sara in the *Solve for X* podcast episode, "[Sea change: Can we alter the chemistry of the ocean to save the climate?](#)" discussing the potential benefits of augmenting ocean alkalinity for carbon dioxide removal. Wil was quoted in *E&E News* with the article "[Scuttled CO2 pipeline renews debate about state hurdles.](#)" Additionally, Project Manager Jenn Brown shared her insights in *Oil and Gas Watch's* article "[Major carbon pipeline is canceled as opposition grows and regulations remain elusive.](#)" addressing challenges associated with CO2 pipelines. The article also focused on the cancellation of the carbon pipeline project by Navigator CO2. Democratic lawmakers are calling for a temporary moratorium on new carbon pipelines until federal safety regulations are updated. Safety concerns, opposition from local communities, and skepticism about carbon capture technology are slowing CO2 pipeline projects. The grassroots opposition to these pipelines is gaining attention, particularly in crucial states like Iowa.

Closing the year, Sara was quoted in an *Atmos* article titled "[The Hijack and Reclamation of Direct Air Capture.](#)" cautioning against viewing direct air capture as a silver bullet and emphasizing the need for critical discussions on its role in climate action.

Educational Resources

"Scrubbing the Skies" Webinar Series

The Institute for Carbon Removal Law and Policy's webinar series, *Scrubbing the Skies: The Role of Carbon Dioxide Removal in Combating Climate Change* focuses on scientific, technological, legal, political, and justice-focused issues associated with carbon dioxide removal. This series is hosted by Co-Director Wil Burns. In 2023, the Institute held the following webinars in this series:



"Betting on Forests and Soils to Reach Net Zero"

This webinar, held on January 19th, 2023, featured two panelists. Harry B. Smith and Naomi Vaughan discussed how European national climate plans are "betting" on the success of forest and soil carbon sequestration to compensate for their remaining 'difficult-to-decarbonize' emissions to reach climate targets.

"Wood Harvesting and Storage with Wood Vault for Durable Carbon Sequestration: Scientific Needs and Societal Impacts"

The participants in this webinar, held February 9th, 2023, included one of the leading proponents of Wood Harvesting and Storage, as well as experts in biomass carbon sequestration and verification and accounting protocols. They discussed the carbon sequestration potential of this approach, as well as critical questions related to monitoring and verification, and the challenges of full-carbon accounting.

"Kenya: Africa's Great Carbon Valley"

This webinar, held February 21st, 2023, featured two panelists. James Irungu Mwangi, the founder of the Climate Action Platform for Africa and TED speaker, discussed Kenya's unique opportunity for CDR. Additionally, Dr. Claire Nelson, co-founder and Chief Science Officer at Cella, looked at the potential for geologic carbon storage in the East African Rift.

"Certifying Soil Carbon Removals: A Soil-focused Assessment of the Proposal for the European Framework for Carbon Removal Certification"

In this webinar, held March 14th, 2023, two German-based researchers, Anne Siemons and Hugh McDonald, critically assessed the EU's latest carbon removal policy proposal. In particular, they evaluated whether the policy proposal will lead to high-quality soil carbon removals that are long-lasting, additional, robustly quantified, and sustainable.

"Transitioning to a Sustainable, Circular Carbon Economy by Converting Waste into Essential Chemicals, Fuels & Products"

This webinar, held April 6th, 2023, featured Tom Dower, VP of Public Policy at carbon transformation industry leader, LanzaTech. Dower covered Lanzatech's efforts to replace fossil fuels with waste carbon supply chains and utilize technological approaches that can effectuate recycling of greenhouse gas emissions into products.

"Enhanced Rock Weathering in the Global South: Exploring Potential for Enhanced Agricultural Productivity and Carbon Dioxide Drawdown"

This webinar, held April 18th, 2023, featured Garrett Boudinot, Founder and CEO of Vycarb, and Yifan Powers, Research Manager of Precision Development Climate Global Team. The panelists discussed their report on ERW and its potential for enhancing agricultural productivity and carbon dioxide drawdown, with a focus on low- and middle-income countries. They addressed the current limitations of ERW implementation and the need for a concerted parallel effort in the Global South to ensure that any future economic benefits accruing to farmers from ERW in the form of carbon offset payments are distributed equitably.

"The Prospects for Carbon Removal in West Virginia"

This webinar, held May 9th, 2023, featured Joan Centrella, Ph.D., Director of WVU Bridge Initiative; Edward Brzostek, Ph.D., Associate Professor of Biology, WVU; Brooke Eastman, Ph.D., Science Policy Fellow, WVU Bridge Initiative; Deborah D. Stine, Ph.D., Science & Technology Policy Academy, Bridge Study Director; and Samuel Taylor, Ph.D., Assistant Director, Strategic Partnerships and Technology, WVU Energy Institute. The panel discussion revolved around WVU's new policymaker guide, "Carbon Dioxide Removal and West Virginia: A Science and Technology Perspective," assessing the potential for the development of a carbon dioxide removal (CDR) sector in West Virginia, considering its distinctive geology, abundant forests, and energy-driven economy.

"Nori's Carbon Removal Blended Tonne Whitepaper"

This webinar, held June 29th, 2023, featured two team members from Nori, Director of Supply and Radhika Moolgavkar Director of Supply and Methodology, and Carbon Methodology R&D Lead Rick Berg. This event was moderated by Wil Burns, Co-Director at the Institute. Nature-based carbon removal is available today at a low cost but has durability challenges. At the same time, permanent CO₂ removal is nascent and higher cost. A new whitepaper by Nori proposes a 'blended tonne' approach that it argues would wed the strengths of both options — immediacy and durability — to offer a net-zero solution. This webinar, held on June 29, 2023, featured two of the architects of this proposal where they discussed both the rationale for this proposal, as well as technical and governance considerations for operationalization.

"Direct Air Capture in the Global South: Octavia Carbon"

This webinar, held August 21, 2023, featured two principals from Octavia Carbon to discuss the scale potential for a modular Direct Air Capture approach to both help combat climate change and further Kenya's development goals. They also discussed the economic challenges DAC faces in the Global South as well as aspects of environmental justice and community engagement associated with deploying DAC in the Global South. Octavia Carbon, based in Kenya, is seeking to develop the first Direct Air Capture facility in the Global South, as well as the cheapest Direct Air Capture hub in the world. Octavia hopes to leverage Kenya's abundant geothermal, talent, and geology to permanently remove CO₂ from the atmosphere cost-effectively. They have just announced their plans to build a 1000tCO₂/yr plant in the Kenyan Rift in 2024, alongside their storage partners at Cella.

"Taming the Wild West of Climate: Bringing Standards and Quality to the VCM"

The science is clear: in addition to large-scale emissions reduction, the Intergovernmental Panel on Climate Change (IPCC) estimates that the global community must remove 100 to 1,000 billion metric tons of carbon dioxide to prevent the most severe, difficult-to-reverse impacts of climate change, including food and water insecurity, mass migration due to extreme weather and temperature, economic disruption, and ecological destruction. Unfortunately, the voluntary carbon market has a quality and quantity problem that has weakened credibility and limited much-needed growth of carbon removal. This webinar, held September 13, 2023, featured Dr. Matthew Potts, Chief Science Officer, and Dr. Bodie Cabiyo, Senior Forest Scientist at Carbon Direct who spoke about the challenges in the voluntary carbon market, and what is required to bring quality carbon dioxide removal to the scale required to hit climate mitigation targets.

"Coccolithophores and diatoms resilient to ocean alkalinity enhancement: A glimpse of hope?"

While there are promising prospects for marine-based carbon removal approaches to effectuate substantial sequestration of carbon dioxide, there are also concerns about the potential ramifications of these approaches for sensitive ocean ecosystems. This webinar, held on September 14, 2023, featured two researchers who summarized the results of their most recent study, which assesses the potential ecosystem impacts of using ocean alkalinity enhancement as an approach to remove carbon dioxide from the atmosphere while mitigating ocean acidification. The study focuses on the potential impacts of ocean alkalinity enhancement on phytoplanktonic organisms. These organisms are chosen for study because they fuel ocean carbon uptake and pelagic productivity and are therefore critical to the balance of marine ecosystems.

"Upscaling Biochar as a Soil Amendment and Waste Management Technology: Lessons from Agricultural History"

Agricultural biochar offers an appealing way to sequester carbon dioxide while also improving farm soils. By pyrolysing organic material (including farm and forestry wastes, but also possibly purpose-grown bio-crops), it is possible to lock atmospheric carbon into a stable solid form, which has numerous benefits when ground up and added to farm soils. Achieving this in practice, however, will require major changes to agricultural and waste management systems, with substantial ramifications from a social, economic, and political perspective. In this webinar, held October 26, 2023, the authors of a new study in Technological Forecasting and Social Change discuss their findings where they argue that we can use the history of three historical analogues for biochar: fertilizer, ethanol fuel, and compost, to predict how the development of a large-scale biochar industry might play out. Taken together, these other approaches suggest that upscaling biochar is far more complex than simply offering the appropriate financial incentives.

"Potential Role of BBNJ Treaty in Ocean-Based CDR"

In late 2023, the Biodiversity Beyond National Jurisdiction (BBNJ) treaty under the United Nations Convention for the Law of the Sea was opened for signature. The treaty is slated to enter into force after sixty nations ratify it. Given the fact that many ocean-based carbon dioxide removal approaches will either be deployed in the open oceans or could have impacts in these areas, the BBNJ may prove to be a key regulatory framework for the emerging industry. In this webinar, held November 7, 2023, two researchers focused on the interface of the BBNJ and ocean CDR and joined Simon Nicholson, Co-Director of the Institute for Carbon Removal Law & Policy, in a roundtable discussion of the BBNJ's potential future role in regulating ocean CDR approaches, as well how the BBNJ will interface with other pertinent ocean regimes.

"Quantifying Biochar Carbon Removal's Global and Country-Level Impact"

Biochar is a carbon-rich material formed by high-temperature conversion of biomass under reduced oxygen conditions. Its production is one of the only established carbon dioxide removal (CDR) methods recognized by the IPCC that can also be scaled quickly enough to counteract the effects of climate change within the next decade. This webinar, held November 21, 2023, focused upon a newly published paper that quantifies, for the first time, biochar production's carbon removal potential at ~6% per year on a global scale, the equivalent of India's annual emissions or removing 803 coal power plants. The paper's framework also quantifies the potential contribution biochar can make toward achieving national carbon emissions reduction goals in 155 countries, making biochar from only sustainably supplied biomass, i.e., non-commercial residues from existing agricultural, livestock, forestry, and wastewater treatment operations. Two of the paper's authors and the International Biochar Initiative, which sponsored this research, served as panelists to discuss biochar carbon removal as a circular climate change solution that should be a part of every country's climate change policy and action plan.

"The Role of Insurance Mechanisms in the Carbon Dioxide Removal Sector"

This webinar, held on December 14th, 2023, considered the critical role that insurance mechanisms may play in driving the growth of carbon removal solutions. This included an assessment of the risks associated with the delivery of nature-based and engineered CDR projects and the practical role insurance plays in areas such as risk selection, pricing, mitigation, monitoring, and transfer. The panelists also tackled the "fungibility challenge," i.e., the issues associated with comparing different carbon credits and finding ways to assess "like-for-like" results. The webinar also included the launch of Kita's innovative policy option to receive eligible claims in replacement carbon credits.

"Carbon Dioxide Removal Developments at COP28"

The 28th Conference of the Parties to the United Nations Framework Convention on Climate Change was marked by kinetic activity in the context of carbon removal, including pertinent language included in the First Global Stocktake under the Paris Agreement, major announcements of new funding for carbon removal initiatives, and a very large number of events focused on the role of carbon removal in the climate response portfolio. The growing role of carbon removal in climate policymaking was palpable at the meeting, but what does it all mean? This webinar, held December 19, 2023, featured a discussion of carbon removal at COP28 with four thought leaders.

Speaking Engagements

In reflection of the past year, our organization has been actively engaged in a series of events centered around Ocean-Based Carbon Dioxide Removal.

Director of Research Sara Nawaz had the honor of participating in several distinguished speaking engagements throughout the year, further solidifying our organization's commitment to knowledge dissemination. Some of these notable engagements include:

- "The challenges of gigaton thinking: Designing deliberations on (ocean-based) carbon removal" at the 4S (Society for Social Studies of Science) Annual Meeting, Honolulu, Hawaii/online in November 2023
- A presentation on "Community engagement on carbon removal" at the Carbon Removal Deployment Symposium in Washington DC in June 2023
- A panel on the social dimensions of marine CDR at Capitol Hill Ocean Week (CHOW) in June 2023
- Expert testimony on 'just and equitable carbon removal' at the hearing on Carbon Removal, Massachusetts State Senate, Committee on Global Warming and Climate Change in April 2023 (highlighting the significance of giving congressional testimony)
- A panel on "Responsible CDR governance in practice" at the Ocean Visions Biennial Summit in Atlanta, Georgia, in April 2023
- And a panel on marine CDR at the Foundation for Climate Restoration in March 2023.

Co-Director Wil Burns significantly contributed to the New York Climate Week discussions by speaking at the "Carbon Newbie Summit" on September 21st. This casual conference catered to carbon newbies interested in gaining a deeper understanding of carbon-related topics. These engagements showcased our dedication to actively participating in high-impact events during New York Climate Week.

Furthermore, throughout the year, Wil Burns actively shared insights on carbon removal topics across various prestigious platforms. His speaking engagements included events at the University of South Carolina, University of Wyoming School of Law, University of Wisconsin School of Law, NOAA Academy of Carbon Dioxide Removal, Global Ocean Health's inter-tribal committee on CDR, and Vanderbilt University School of Law. Additionally, Wil played a significant role as a featured speaker throughout this year at the Southern Methodist University Dedman School of Law's "Subsurface Resources Colloquium." This event, hosted by the Subsurface Resources Research Cluster, Dedman College Interdisciplinary Institute, focused on the potential role of marine-based carbon dioxide removal and the associated governance considerations.

These collective efforts throughout the year underscore our commitment to staying at the forefront of discussions and initiatives related to carbon removal. As we continue to actively participate in events and share our expertise, our organization remains dedicated to the principles of justice, equity, and sustainable carbon removal.



Events, Projects, & Collaborations

Third Annual Conference on Carbon Dioxide Removal Law & Policy

Our third Annual Carbon Removal Law & Policy Conference was held online on November 9th, 2023, co-convened by The Institute for Carbon Removal Law & Policy in conjunction with its partner, American University's Washington College of Law. This year's conference theme was "Carbon Removal Deployment: Law and Policy from Planning to Project," and sought to capture the stage where we find ourselves in the context of the roles of law and policy in the field.

Carbon Removal Deployment: Law and Policy from Planning to Project

Carbon dioxide removal developments have been unfolding at a lightning pace in the past few years, with the field rapidly emerging from the largely notional to a stage where it's poised to begin making a substantive contribution to battling climate change. This year, we explored CDR certifications and ways in which CCS regulation has implications for CDR and emerging regulations, and more.

You can find all the session recordings here: bit.ly/3rdCDRconference



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& ENERGY LAW

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REMOVAL LAW AND POLICY

National Symposium on Climate Justice & Carbon Management

In June 2023, the Institute supported the convening of the National Symposium on Climate Justice & Carbon Management. This event was hosted by WE ACT for Environmental Justice, the Deep South Center for Environmental Justice, and GreenLatinos. The meeting took place at the Johnson Foundation at Wingspread in Racine, Wisconsin and brought together leading figures from the environmental justice, federal policy, carbon removal development, and procurement communities, for co-learning and deep interrogation of the emerging carbon management landscape.

Carbon Justice Fellows Program Inaugural Cohort

The Institute is proud to have launched the inaugural year of our Carbon Justice Fellows Program in the summer of 2023. This Fellowship, co-convened by the National Wildlife Federation, was a selective, competitive program where 11 early and mid-career professionals and scientists were selected from across the nation and two locations abroad. This cohort participated in an intensive, two-week program on the equity and justice dimensions of carbon removal. One of the fellows, Jake Ferrel, will stay in D.C. and work with NWF to guide their peers from their respective locations for a year of continued engagement. The fellows hail from organizations and universities including West Virginia Rivers Coalition, Our Climate Education Fund, The Vessel Project of Louisiana, and Texas Campaign for the Environment. The Institute is incredibly proud of this amazing cohort and the success of the program. Read the press release bit.ly/pressreleasefellows. For a more in-depth perspective, read this blog written by Jake bit.ly/nwf.



The Carbon Removal Justice Fellows meet with members of the Senate Budget Committee on Capitol Hill. Photo credit: Jake

"Progressive Political Economy of Carbon Removal" Workshop and "Agenda for a Progressive Political Economy of Carbon Removal"

Director of Research Sara Nawaz led a workshop this summer titled "Progressive Political Economy of Carbon Removal," which took place over the course of three days in Washington, DC. This innovative workshop brought together a group of carbon removal experts from academia, NGOs, and creative and organizing backgrounds. The sessions aimed to imagine carbon removal 'done well' and develop a set of actionable steps for how carbon removal might support climate justice.

Sara and the workshop participants produced a report out of the workshop, "Agenda for a Progressive Political Economy of Carbon Removal." The report introduces four bold policy ideas that key policy actors like governments and philanthropic funders might pursue. It also outlines key future research, policy and movement-building priorities needed to advance carbon removal that align with progressive values of real climate action, justice, labor rights, democratic participation, and others. Sara and colleagues are also working on a peer-reviewed journal article that further builds on workshop findings.

The report will officially be launched in mid-February 2024.



A Symposium for Carbon Removal Deployment

This Symposium, held June 21-22 2023, was co-hosted by The Institute for Carbon Removal Law and Policy at American University, XRPIZE Carbon Removal, Consortium for Science Policy & Outcomes at Arizona State University, and the Carbon Business Council and its sister organization the Carbon Development Council. This two-day "summer school" was aimed at carbon removal project developers and symposium participants who heard from leaders in the carbon removal field and received actionable information for how projects can be deployed responsibly. The symposium had a specific focus on best practices for developing a Community Benefits Plan. These plans, a required and critical component of many federal funding applications, help to foster proactive and collaborative community engagement. All attendees who participated in the workshop received a certificate of completion.

Carbon Dioxide Removal Responsible Deployment Training

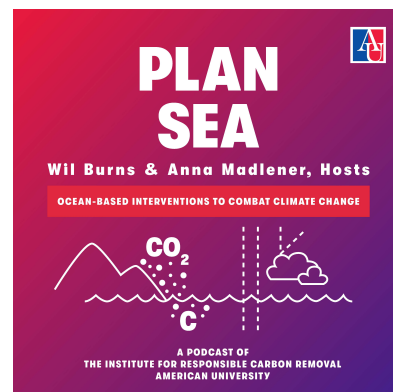
As a follow-up to the symposium, the Carbon Business Council released the CDR RDT, an online training course & suite of foundational resources for the responsible deployment of Carbon Removal. XRPIZE Carbon Removal is requiring completion of the CDR Responsible Deployment Training online training for companies applying to \$100 million competition.

The Institute's Project Manager Jenn Brown and Co-Director Wil Burns served as advisory board members for the development of this training.

The introductory online course is the first-of-its-kind training and a first step for project developers to dive into why robust community engagement is critical, what concerns are being raised in communities about carbon removal, and how to begin community engagement. It is paired with additional tools and resources. This is a community resource available at no cost: <https://www.carbonbusinesscouncil.org/rdt>.

Plan Sea Podcast

The “Plan Sea” Podcast with Wil Burns and Anna Madlener focuses on oceans-based climate geoengineering options that seek to reduce incoming solar radiation (solar radiation modification) and oceans-based approaches that aim to remove carbon dioxide from the atmosphere (carbon removal). The podcast scrutinizes risks and benefits of these options, as well as matters of governance, stakeholder engagement, ethics, and politics.



["Recommendations for permitting seaweed cultivation in California with Romany Webb,"](#)

January 3, 2023

Wil Burns speaks to Romany Webb, an Associate Research Scholar at Columbia Law School and Deputy Director of the Sabin Center for Climate Change Law, about local legislation around coastal and ocean carbon removal. Romany recently authored a paper entitled "Permitting seaweed cultivation for carbon sequestration in California: barriers and recommendations" and is on the podcast to discuss her experience with state and local legislation on the matter.

["Pull to Refresh - a carbon reversal program,"](#)

January 20, 2023

Arin Crumley and Christian Robinson join Wil Burns and guest host (and producer), Andrew Lewin on the podcast to discuss their business called Pull to Refresh. The idea was borne out of a number of interactions on Clubhouse to help people and businesses reverse the effects of climate change.

["How carbon sequestration will be measured, reported, and verified \(MRV\) in the future,"](#)

February 13, 2023

Host Wil Burns and producer, Andrew Lewin, welcome Mowgli Homes to the podcast to discuss the measuring, reporting, and verification (MRV) of carbon sequestration in the future. Mowgli is the CEO of Submarine, which is hoping to help the industry navigate the shoals of MRV in a cost-effective and high-integrity fashion.

"The pathways for ocean-based carbon removal approaches,"

March 14, 2023

Dr. Jessica Cross joins Anna Madlener and Wil Burns on the podcast to discuss the driving and scientifically informed academic, entrepreneurial, and legislative pathways for ocean-based carbon removal approaches.

"Operational monitoring for detection, attribution and determination of side effects of marine CDR,"

March 28, 2023

Philip Boyd joins Wil Burns and Anna Madlener in this episode of the podcast to discuss a recent publication, "Operational Monitoring of Open-Ocean Carbon Dioxide Removal Deployments: Detection, Attribution, and Determination of Side Effects".

"Matt Long on the [C]worthy initiative for MRV modeling frameworks,"

April 12, 2023

Matthew Long joins Wil Burns and Anna Madlener to discuss his role at the National Center for Atmospheric Research: Climate and Global Dynamics and the Cworthy project, a non-profit research organization to develop the scientific and technical tools associated with quantifying ocean carbon dioxide removal and leveraging those tools to bolster the monitoring, reporting, and verification of carbon dioxide removal.



"Exploring the Risks and Riches of the Deep Sea Ecosystems in Climate Interventions: A Discussion with Lisa Levin,"

May 2, 2023

The podcast focuses on the risks of ocean-based climate interventions and solar radiation options to deep ocean ecosystems. The guest, Lisa Levin, is a distinguished professor at the Scripps Institution of Oceanography and the lead author of a recent article in the journal Science called "Deep Sea Impacts of Climate Interventions." She explains that most ocean-based carbon removal technologies involve dumping materials and carbon into the ocean floor, which could affect the many different ecosystems of the deep sea.

"Mike Kelland of Planetary Technologies on Ocean Alkalinity Enhancement Policy and Community Engagement,"

May 17, 2023

This episode takes a deep dive into Planetary Technologies' recent challenges, focusing on community engagement and the development of their first pilot site in Cornwall, UK. Hosts, Anna and Wil, are joined by Mike Kelland, CEO and co-founder of Planetary Technologies, a Canadian startup pioneering the field of Ocean Alkalinity Enhancement (OAE). Mike unravels his invaluable insights, experiences, and future projections on the critical research needed to alleviate uncertainties surrounding OAE. Echoing previous discussions on the impacts of climate interventions on deep-sea ecosystems, this episode examines OAE's potential implications and the careful balancing act required for such a pioneering initiative.

"Rose Sharifian of SeaO2 on Electrochemical Ocean Carbon Capture and the European Marine CDR Community,"

29, 2023

Rose Sharifian, CTO of the Dutch startup SeaO2, joins Plan Sea to talk about their electrochemical ocean carbon capture approach. Rose, Anna and Wil discuss SeaO2's technical roadmap, electrochemical membrane technology as well as challenges and opportunities they are facing in the European CDR market. Rose also shares how SeaO2 fits into the global picture of marine CDR startups and why she believes they are amongst the furthest in their development.

"Exploring the OAE Best Practice Guide with Jean-Pierre Gattuso and Andreas Oschlies," September 12, 2023

This episode's guests are Jean-Pierre Gattuso, CNRS research professor at Sorbonne University and Institute on Sustainable Development and International Relations, France, and Chair for Ocean Acidification and other ocean changes – Impacts and Solutions at Prince Albert II of Monaco Foundation; and Andreas Oschlies, professor and head of the biogeochemical modeling research unit at GEOMAR Helmholtz Centre for Ocean Research in Kiel, Germany.

"SEAO2 CDR: An Insight into the European Ocean CDR Space with Christopher Pearce, Patricia Grasse and Christine Merk,"

September 26, 2023

This episode featured three representatives of the SEAO2-CDR project, a European effort to determine strategies for the evaluation and assessment of ocean-based carbon dioxide removal. The project's aims range from a strongly interdisciplinary background and focus not only on scientific but also economic, legal, political, social and ethical aspects. The episode featured the project's Scientific and Technical Lead, Dr. Christopher Pearce from the National Oceanography Center in the UK. Dr. Christine Merk of the Kiel Institute for the World Economy, who co-leads WP4 Understanding public and stakeholder perceptions. Dr. Patricia Grasse, University of Leipzig and GEOMAR Helmholtz Centre for Ocean Research, who leads WP7 Integrated assessment of ocean-based CDR deployment.

"Dr. Ken Buesseler on New Perspectives and Opportunities for Ocean Iron Fertilization,"

October 10, 2023

Dr. Ken Buesseler, senior scientist at the Woods Hole Oceanographic Institution, joins us to discuss new perspectives and opportunities of ocean iron fertilization (OIF) as a carbon removal solution. Ken explores with us how the journey of OIF has evolved as one of the first researched carbon removal solutions from about a decade ago to today. We discuss what OIF is, what the new effort ExOIS, Exploring Ocean Iron Solutions, entails and why it is important for the development of OIF. We discuss the history of OIF as well as how new technology development could help answer some of those early risks, including progress on the front of monitoring, reporting and verification (MRV) of both carbon and environmental parameters.

"David Kowek of Ocean Visions on the Importance of Interdisciplinary Networks for Marine Carbon Dioxide Removal,"

October 24, 2023

This episode featured David Kowek, who holds a Ph.D. from Stanford University in Earth System Science and is currently the Chief Scientist of Ocean Visions, a non-profit organization comprised of a network of leading universities and oceanographic research institutions and partners. Ocean Visions works to engage and focus resources from across this network for concerted action, catalyzing collaboration for the co-design, development, testing, and evaluation of solutions to the interlocking ocean-climate crisis. David spoke on about Ocean Vision's general work and thematic pillars. In particular, we discuss the importance of field trials in order for scaleup of mCDR approaches, as well as what is currently hindering scaling generally. As the episode navigated these different thematic focus points, David presented Ocean Vision's amazing resources such as the Launchpad Program, CDR Roadmaps, and their curated CDR Community. Finally, David also shed light on the important work they are doing on an international stage at the United Nations.

"Dr. Matt Eisaman and Frances Simpson-Allen on Ebb Carbon's Ocean Alkalinity Enhancement Approach and Developments,"

November 6, 2023

Dr. Matt Eisaman and Frances Simpson-Allen join Plan Sea to discuss Ebb Carbon's marine carbon dioxide removal approach and their latest developments. Matt is a cofounder and Chief Scientist as well as Associate Professor at Yale University in the Department of Earth & Planetary Sciences and the Yale Center for Natural Carbon Capture (YCNCC). Frances is their Director for Policy and Market Development. This episode discussed the necessity of field trials, challenges on their path to scaleup, as well as very importantly the relevance and importance of social engagement strategies. Particularly, it highlighted Ebb's most recent public-private partnerships and plans for the upcoming year. The episode also delved into the world of regulation and policy and how that interacts with Ebb's approach and operation.





The Institute for Responsible
Carbon Removal, housed at
American University, is dedicated
to building responsible carbon
removal futures.

Who We Are



Simon Nicholson
Co-Director



Wil Burns
Co-Director



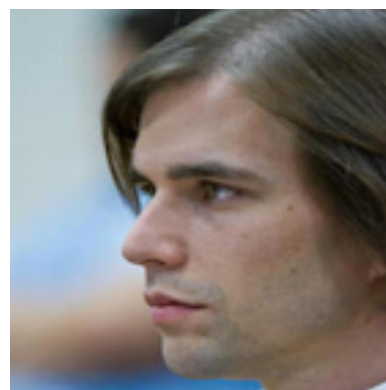
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