2020

YEAR-END REPORT
This year has brought many unexpected difficulties and challenges. We as a global community have been forced to change courses of action and adapt. The Institute stands with all who have worked to persevere through the hardships, disappointments and devastations the year has brought. Although this year did not go as planned, we have still been able to engage in meaningful dialogue on many platforms, reinvigorate our Carbon Removal Working Group, pursue new projects and create partnerships and more.

BACKGROUND

The Institute for Carbon Removal Law and Policy (ICRLP or the Institute) is a scholarly initiative of the School of International Service at American University in Washington, D.C. The Institute was launched in October 2018 in response to growing scientific and political attention to carbon removal technologies and practices as a potential response mechanism to climate change. We are dedicated to assessing the social, legal, ethical, and political implications of carbon removal and to the characterization and promotion of sustainable carbon removal approaches.

What is carbon removal?
Carbon dioxide removal (CDR) 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: http://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. Discussions of employing these technologies have emerged in mainstream international climate change response discussions and, on occasion, in domestic climate policy discussions. However, there is still much uncertainty surrounding the technological feasibility and social implications of these technologies. In order to make responsible decisions about the use of carbon removal, these uncertainties must be clarified and critically assessed.
The Institutes 2020 Accomplishments

The Institute seeks to be part of the landscape of carbon removal discussions by educating and engaging stakeholders to ensure informed, critical assessments of carbon removal’s role in climate policy. Despite the many challenges presented in 2020, the Institute has continued to promote the robust assessment of carbon removal though ongoing research and publication, educational engagement and participation, partnerships with NGO stakeholders, a newly envisioned Carbon Removal Working Group, and the launch of a new project to produce a variant of the Global Change Analysis Model (GCAM).

Selected Academic Papers from Director of Research, Co-Directors, and Fellows


Carbon dioxide removal (CDR) is rising up the climate-policy agenda. This can help ensure that CDR supports the kind of robust, abatement-focused long-term climate strategy that is essential to fair and effective implementation.


This article brings recognition to the fact that carbon dioxide removal and climate change adaptation are rarely analyzed together, yet it is critical to consider the interactions between these forms of climate response. This work identifies ways to foreground adaptation in carbon removal policies and project designs and to incorporate carbon removal into adaptation efforts.

This paper points to the fact that there is increasing urgency for large-scale deployment of carbon-removal approaches to help avoid passing critical climatic thresholds. Given the severe risks of many terrestrial methods at extremely large scales, there is a compelling need to also assess the potential of marine negative-emissions technologies, such as artificial ocean alkalinization.


In this working paper, the authors try to cut through one of the thorniest knots in this confusing conversation: what is the relationship between carbon removal and carbon capture with utilization and storage (CCUS)? The paper encourages people to stop worrying so much about technological categories and focus instead on two simple questions: 1) Where does the captured carbon come from? 2) Where does the captured carbon go?


This introduction sets the tone for this special issue, which looks squarely at the complex intersections between new technologies, including those that comprise carbon removal options, and global environmental politics.

In this paper the authors assess cost-effective tropical country-level potential of natural climate solutions (NCS)—protection, improved management and restoration of ecosystems—to deliver climate mitigation and carbon removal linked with sustainable development goals (SDGs).


This paper examines how adoption of CDR technologies at a scale sufficient to draw down carbon emissions will require both individual and collective decisions that happen over time in different locations to enable a massive scale-up.


This paper examines how most scenarios that achieve present climate targets of limiting global heating to 1.5°–2.0°C rely on large-scale CDR to drive net emissions negative after mid-century. Scenarios that overshoot and return to a future temperature target, or that aim to restore some prior climate, require CDR to be rapidly deployed, operated for a century or so, then greatly reduced or phased out.


This paper examines how carbon dioxide is a waste product of combusting fossil fuels, and its accumulation in the atmosphere presents a planetary hazard and is also managed and used as a resource. The analysis looks at the historical evolution of solid and liquid waste regimes to draw lessons for the future evolution of a gaseous waste regime.

This paper surveys the “long history” of carbon removal and seeks to draw out lessons for ongoing research and the emerging public debate on negative emissions. The authors argue that research and policy on negative emissions should proceed not just from projections of the future, but also from an acknowledgement of past controversies, successes and failures.


In this book, Holly J. Buck charts a possible course to a liveable future. Climate restoration will require not just innovative technologies to remove carbon from the atmosphere, but social and economic transformation. Looking at industrial-scale seaweed farms, the grinding of rocks to sequester carbon at the bottom of the sea, the restoration of wetlands, and reforestation, Buck examines possible methods for such transformations and meets the people developing them.

A Selection of Other publications from ICRLP Director of Research, Co-Directors, and Fellows


This article brings together these three experts who collectively believe that it is time to consider at least two forms of geoengineering, solar radiation management and carbon dioxide removal.

>This article explores the role Africa should play in demanding a politics where carbon removal features as an aspect of systemic change rather than an alternative to it. We assess cost-effective tropical country-level potential of natural climate solutions (NCS)—protection, improved management and restoration of ecosystems—to deliver climate mitigation and carbon removal linked with sustainable development goals (SDGs).

“An International Climate Agenda for the Next U.S. Administration”
Contributed in part by Fellow Jason Funk; Brendan Guy, Jake Schmidt et al. 2020, NRDC. https://www.nrdc.org/experts/jake-schmidt/international-climate-agenda-biden-administration.

>This report, which has been utilized by the Biden transition team, includes a provision for leveraging trade policy to incentivize decarbonization utilizing trade tools which are an essential component of a U.S. strategy to drive rapid and deep emissions reductions.

NEW DEVELOPMENTS, COLLABORATIONS, EVENTS AND FACILITATIONS

ICRLP Post-doctoral Researcher

The Institute is incredibly grateful to have the privilege of working with Dr. Raphael Apeaning, who was brought on as Postdoctoral Researcher in 2020. Dr. Apeaning’s research focuses on exploring the interplay between socio-economic development and climate mitigation policies, through the lens of the existing state and expected transitions of the global energy systems. This research mainly applies integrated energy-climate-economic models to explore the dynamic of low-carbon investments under assumptions of socio-economic and technological constraints.
Dr. Apeaning completed his Ph.D. at SUNY Stony Brook’s Technology, Policy and Innovation program in 2019. He holds an M.Sc. in Energy and Environment Engineering from Linkoping University in Sweden and B.Sc. in Agricultural Engineering from Kwame Nkrumah University of Science and Technology in Ghana.

**New Project Introducing Carbon Removal Options into GCAM**

Earlier this year, ICRLP launched a project to produce a variant of the Global Change Analysis Model (GCAM), a major Integrated Assessment Model (IAM) developed by the Joint Global Change Research Institute. IAMs are computer models that combine a model of the climate system with models of the economy, the energy sector, and land use to help researchers think rigorously about possible climate futures.

Director of Research David Morrow is working with Post-doctoral Researcher Raphael Apeaning to extend GCAM’s ability to model carbon removal. That involves both incorporating additional approaches to carbon removal, starting with direct air capture, enhanced weathering, ocean alkalinization, and soil carbon sequestration; and giving GCAM the capacity to model various policies for incentivizing and supporting carbon removal. We gratefully acknowledge the financial support of the Alfred P. Sloan Foundation for this project.

**Undergraduate Mentorship**

AU School of International Service undergraduate Garrett Guard (Garrett Wiehler) completed his capstone project with the Institute, under the guidance of David Morrow. Through this project, he served as an Undergraduate Research Associate for the Institute. He completed his research project, “Using an integrated assessment model to assess the global implications of differing bioenergy carbon capture and sequestration policy schemes,” and submitted it to a peer-reviewed
scientific research journal just before graduating from American University in December 2020.

**Conference Presentations**

Director of Research David Morrow presented on “Carbon Removal and Climate Justice” at an online climate ethics workshop organized by Princeton University’s Climate Futures Initiatives in August.

In December, ICRLP Post-doctoral Researcher Dr. Raphael Apeaning and Research Associate Garrett Guard presented on the assessment of deep mitigation scenarios, including the use of carbon dioxide removal at the Integrated Assessment Consortium (IAMP) Annual Meeting.

Garrett also presented at the American Geophysical Union Fall Meeting Scientific Program, in December.

**NGO Engagement & Partnership**

The Institute has partnered with the Union of Concerned Scientists to engage with the NGO community, working to imagine and promote more just, equitable, and inclusive understandings of carbon removal. This partnership will aim to expand the carbon removal conversation and draw on the knowledge, interests, and perspectives of a wider array of voices. We gratefully acknowledge the support of the New York Community Trust for this work.

**Carbon Removal Working Group**

The Institute organized a working group of staff from environmental NGOs two years ago, with the goal of sparking and facilitating an ongoing sharing of perspectives and resources about carbon removal. The group offers a space for
members to probe various carbon removal approaches and issues, with the intent that information and findings from the meeting would inform exploration of carbon removal in their home institutions.

In a joint project with the Union of Concerned Scientists, our new Project Assistant Allison Tennant has reinvigorated the group to help imagine and promote a more just, equitable, and inclusive understanding of carbon removal. We will be seeking to expand the carbon removal conversation to draw on the knowledge, interests, and perspectives of a wider array of voices, recognizing that different carbon removal approaches are poised to have implications across a diverse set of sectors and communities.

**CDR Tools**

ICRLP Co-Director Wil Burns has partnered with Sabin Center for Climate Change Law and Columbia SIPA Center on Global Energy Policy in the creation of an exciting new carbon dioxide removal law resource. Funded by Climeworks, this valuable resource provides an annotated bibliography of legal materials related to carbon dioxide removal and carbon sequestration and use.

**Webinar Collaborations**

Co-director Simon Nicholson and Director of Research David Morrow presented on webinars organized by the Carnegie Climate Governance Initiative (C2G), covering the governance of direct air capture and the relationship between carbon removal and the Sustainable Developments Goals (SDGs).

Co-director Wil Burns served as panelist for a November AirMiners webinar, themed "Pathways and Methods" focusing on ocean CDR innovation, offering expertise on the subject matter.

Co-director Wil Burns also took part in a webinar hosted by the Environmental Law Institute in February titled, "Geoengineering: A Climate Conundrum?" Topics discussed included, should the policymakers addressing climate change today rely upon the technologies of tomorrow?
**Project Vesta**

Co-Director Wil Burns began laying the groundwork this year for a collaboration and formation of an advisory committee for **Project Vesta**, which is a non-profit that uses the natural process of weathering volcanic rocks to trap CO₂. This process in turn leads to the creation of green-sand beaches that contain an abundance of volcanic mineral called olivine. Wave action speeds up the CDR process while simultaneously de-acifying the ocean.

**Survive the Century: A Cli-fi Story of Choice and Consequences**

Co-director Simon Nicholson is working with science fiction writer Sam Beckbessinger, and South African ecologist Chris Trisos, with the support of the Global Strategic Communications Council, to create an online choose-your-own adventure climate fiction story. This project aims to fill a particular “climate futures literacy” gap. A first version of the game is set to launch in early 2021.

**Looking forward to 2021**

The coming year will be an important one for carbon removal in the United States, as the new Biden-Harris administration grapples with the role that carbon removal ought to play in aggressive national climate policy and in international climate response efforts. The Institute will be working with NGO and corporate partners and with people at various levels of government to continue to advance sustainable carbon removal.
EDUCATIONAL RESOURCES

The Institute has developed a comprehensive set of digestible educational tools to help actors gain the information needed to critically engage in discussions concerning carbon removal. These resources are separated into the following categories:

Blogs

The Carbon Removal Blog which launched in Fall 2019 continues to evolve and serve as an informative tool for the public by publishing short, timely posts on all aspects of carbon removal by experts in the community. This year we have published blogs that delve into that summarize the many educational tools ICRLP has available, new projects and partnerships and public facing CDR issues to name a few. As we go into 2021, this blog platform will continue to communicate the many aspects of CDR in an easily digestible and comprehensive manner for a wide audience.

Abstracts

Last year, the Institute began the practice of publishing “Plain English Abstracts” as a means to make latest literature on carbon removal accessible and understandable to diverse audiences, and this project has continued to evolve this year. As we enter into 2021, we continue to invite authors of academic papers to translate their findings into these “Plain English Abstracts.” Please email icrlp@american.edu if you recently published an academic paper and would like to submit an abstract.
**Action tracker**

As a response to the growing number of corporate climate pledges, the Institute has created an **Action Tracker** outlining some interesting moves regarding climate action in aviation, energy, heavy industry, and other harder-to-abate sector, as well as large financial actors and retail companies. The Action Tracker includes companies that have made climate pledges that entail some use of large-scale carbon removal. Some of these companies have pledged to become carbon neutral or reach net-zero emissions, while others have plans to become carbon-negative, meaning that they will be removing more carbon dioxide from the atmosphere than they emit.

**Webinar Series**

This **webinar series**, launched in 2019, is dedicated to the promotion of meaningful dialogue surrounding CDR by bringing together experts together to examine particular carbon removal technologies. This year we have hosted the following webinars:

**The Law of Enhanced Weathering in Carbon Dioxide Removal, December 2020**

The Institute for Carbon Removal Law and Policy presents a discussion with Romany Webb, Senior Fellow at the Sabin Center for Climate Change Law, on her new paper "The Law of Enhanced Weathering for Carbon Dioxide Removal." Brief Paper Summary: "The Law of Enhanced Weathering for Carbon Dioxide Removal, by Romany Webb, provides a comprehensive analysis of legal issues associated with the performance of enhanced weathering on land and in the oceans. As the paper explains, there are currently no international or U.S. laws dealing specifically with enhanced weathering, but projects could be subject to various existing general environmental and other laws. The paper surveys potentially applicable existing laws and identifies areas where new laws could be adopted, or existing ones revised, to reduce uncertainty and facilitate the development of enhanced weathering projects."
Biochar: An ICRLP Explainer Video, November 2020
This webinar on biochar explored what it is, how it's made, and its role in carbon removal. The speakers also discussed biochar's co-benefits and side effects. Some other topics addressed included: biochar in carbon finance, the persistence of biochar, and biochar's effects on soil and other greenhouse gases.

Equity and Justice in Carbon Removal, October 2020
In this webinar, Ugbaad Kosar from Carbon 180; Augustine Njamnshi from Pan African Climate Justice Alliance; and Arunabha Ghosh from the Council on Energy, Environment, and Water discuss equity and justice issues relating to carbon dioxide removal options and ways to address them. Wil Burns, Co-Director of the Institute for Carbon Removal Law and Policy, moderates. This webinar is part of a series exploring different aspects of carbon removal.

Agroforestry, September 2020
This webinar focused on the technological, economic and political issues associated with agroforestry. In particular, the speakers presented on the different types of agroforestry, how prevalent it is today, and how it removes and sequesters carbon. They also discussed risks and benefits, barriers to widespread adoption, and potential policies to address these issues.

Carbon Removal and Corporate Climate Commitments, August 2020
This webinar on corporate climate commitments and carbon removal examined how with many companies like Apple and Microsoft recently announcing net-zero (or net negative) commitments, now is the time to ask how carbon removal fits into these commitments. This webinar further explored how corporate commitments are likely to affect the development and deployment of carbon removal and how realistic these plans really are.
**Enhanced Oil Recovery, June 2020**
In this webinar, Brian F Snyder from Louisiana State University; John Noel from Greenpeace and Deepika Nagabhushan from the Clean Air Task Force discussed technological, economic and political issues associated with Enhanced Oil Recovery (EOR). Questions addressed during this discussion included: Can EOR facilitate investment in non-EOR storage? And what levels of carbon and oil prices are required to make either EOR or saline storage cost effective?

**Mitigation Deterrence, May 2020**
In this webinar Nils Markusson, Duncan McLaren, and Rebecca Willis of Lancaster Environment Centre at Lancaster University UK presented results from a project called “Assessing the Mitigation Deterrence effects of Greenhouse Gas Removal technologies.” The project is aimed at analyzing such effects and explores under what conditions Greenhouse Gas Removal technologies can be used with as little risk of mitigation deterrence as possible.

**Direct Air Capture, April 2020**
In this webinar, Jen Wilcox from Worcester Polytechnic Institute Christoph Beuttler from Climeworks and Sahag Voskian from MIT discussed the ins and outs of Direct Air Capture to provide a more comprehensive and complete understanding for a wider audience.

**Enhanced Mineral Weathering, March 2020**
In this webinar, ICRLP Co-Director Wil Burns, Phil Renforth from Heriot Watt University, David Keller from GEOMAR Helmholtz Centre for Ocean Research and Gregory Dipple from the University of British Columbia discuss the ins and outs of Enhanced Mineral Weathering to provide a more comprehensive and complete understanding for a wider audience.

**Governance of Marine Geoengineering, March 2020**
In this webinar, ICRLP Co-Director Wil Burns, Kerryn Brent from the University of Adelaide and Jeffrey McGee from the University of Tasmania discussed the potential role of marine climate geoengineering approaches such as ocean alkalinity enhancement and "blue carbon." Focusing on the governance of marine geoengineering research and deployment, along with potential risks of this approach, this webinar came on the heels of CIGI's [Special Report](https://example.com) on the topic authored by Brent, Burns, and McGee.
Communicating Carbon Removal, February 2020
In this webinar, Matthew Nisbet from Northeastern University, Angela Anderson from the Union of Concerned Scientists, Jan Mazurek, from ClimateWorks, and Hunter Cutting from Climate Nexus looked at the challenges associated with communicating about the need for and options associated with carbon removal. This webinar came on the heels of ICRLP's report, "The Carbon Removal Debate" that looked at how it is that carbon removal has suddenly appeared on the climate policy agenda, why the entire field needs additional scrutiny, and how to build a better carbon removal conversation.

SELECT SPEAKING ENGAGEMENTS

Wil Burns, Co-Director

01.30.20 “The Green New Deal and Carbon Dioxide Removal Options”
Building a Green New Deal In the Rust Belt: Legal, Policy and Democratic Challenges, Gilvary Symposium 2020, University of Dayton, Dayton, OH

02.14.20 “International Governance of Carbon Dioxide Removal Options”
ECOLE: Emerging Technologies in Occupational Health and the Environment Workshop Program, Louisiana State University School of Law, Baton Rouge, LA

02.27.29 “The Challenge of Climate Geoengineering” Podcast, Center on National Security, Fordham University

03.03.20 “Overview of Carbon Dioxide Approaches” Northwestern Energy Technology Group, Northwestern University,
04.01.20 “20th International Wildlife Law Conference, Stetson University College of Law” *Impacts of Climate Geoengineering on Biodiversity and Potential Avenues of Governance.*

06.14.20 “International Regulation of Marine Geoengineering Interventions” *Energy Futures Institute Meeting on Marine Geoengineering*

09.02.20 “International Regulation of Marine Geoengineering Interventions” *Environmental Law Association of South Africa, 9th Annual Conference*

10.08.20 "Role of Oceans in Climate Change and Sea Level Rise Conference," UN Side Event, *Overview of Ocean Carbon Dioxide Removal Options*

10.12.20 Presentation at Urban Coast Institute Speakers Series, Monmouth University, *Antacids for the Sea: The Potential Role of Ocean Alkalination Enhancement in Combating Climate Change*


11.10.20 Presentation for an Air Miners Webinar on Ocean-Based Carbon Removal Approaches, *Overview of Legal Regulation of Ocean-Based Carbon Removal Approaches*
The Institute for Carbon Removal Law and Policy, housed at American University, is committed to the assessment and promotion of sustainable carbon removal technologies and practices.
WHO WE ARE

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Simon Nicholson, Co-Director

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