

BERKELEY CLIMATE MAP — CARBON REMOVAL -- MARCH 2025

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Includes all CDR Strategies (technological and natural) – Forest afforestation/reforestation, soil carbon enhancement, wetlands/peatlands restoration, biochar, ocean-based sequestration (blue carbon), enhanced rock weathering, (mineral carbonization), BECCS, point source capture, direct air capture, carbon utilization, geologic storage

First	Last	Affiliation (primary)	Summary	Selected Projects/Reports/Classes
Peter	Agbo	LBNL	Agbo has proposed a novel direct ocean capture scheme. The approach aims to remove CO ₂ from the oceans, enhancing their capacity to absorb excess atmospheric CO ₂ .	
David	Alumbaugh	LBNL	Lead, Carbon Storage Program (geological storage) at LBNL.	
Bhavna	Arora	LBNL	<u>Head of the Carbon Removal and Mineralization Program</u> at LBNL. Developing new strategies to capture carbon dioxide directly from the atmosphere and store it in geological, terrestrial, or ocean reservoirs, or in products. Arora leads projects on enhanced weathering applications in agricultural fields. Her research utilizes reactive transport modeling to assess the feasibility and scalability of ERW for atmospheric carbon removal.	

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John	Bailey	RCNR	Director, ANR Hopland Research Center . Carbon sequestration in soils. Biochar.	
	Bakar Institute of Digital Materials for the Planet	CDSS/Chemistry	Omar Yaghi , Co-Director and Chief Scientist. Christian Borgs, Director. BIDMaP will speed up the development of reticular chemistry and modular structures for achieving cost-efficient, easily deployable ultra-porous metal-organic frameworks (MOFs) and covalent organic frameworks (COFs).	Media coverage for new October 2024 paper in Nature on COFs that could be a “game changer” for direct air capture. Senior author Omar Yaghi and Lead Author Zihui Zhou (Chemistry). KQED interview and Science Daily’s piece here .
Jill	Banfield	RCNR	Deputy Director, Microbiology, Innovative Genomics Institute . Climate, health and agriculture. Focuses microbial processes that can be harnessed for carbon capture and sequestration.	“Engineering the Microbiome with CRISPR to Improve our Climate and Health.” \$70M
	Belowground Biochemistry (Focus Area)	LBNL	Better understanding of the role of soils in the global climate system. 3 field stations Leaders: Margaret Torn, Eoin Brodie, Peter Nico	
	Berkeley Sensor and Actuator Center	Engineering	John Candelaria, Executive Director . Interdisciplinary engineering research on micro- and nano-scale sensors, moving mechanical elements, microfluidics, materials, and processes	
Sebastien	Biraud	LBNL	Climate Sciences Department head at LBNL.	Ameriflux, Deputy Project Lead

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				Capture6 – big water and carbon capture system CEC grant
Jens	Birkholzer	LBL	Senior Scientist, EESA , geologic carbon sequestration	Large DOE grant Sept 2024 for critical minerals and materials supply chains
James	Bishop	ESPM	Bishop specializes in ocean carbon cycle dynamics. His research includes studying the processes that control the distribution and variability of carbon in the ocean, which is crucial for understanding ocean-based carbon sequestration.	
Hanna	Breunig	LBL	Deputy-Head of the Sustainable Energy and Environmental Systems Department in the Energy Analysis and Environmental Impacts Division at LBNL. Breunig studies enhanced weathering processes to accelerate natural CO ₂ removal from the atmosphere	Techno-economic analysis of a CO2 direct air capture-cooling tower hybrid process at a geothermal facility (Chemrxiv)
	Carbon Management Program	LBL	Multi-faceted program for carbon management — Engineered & nature-based solutions to lower carbon emissions and remove CO ₂ from the atmosphere. Carbon Monitoring and Measurement Margaret Torn Carbon Sink (soils) Margaret Torn	

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			Carbon Removal and Mineralization Bhavna Arora Carbon Storage David Alumbaugh Integrated Emissions Management (methane) Sebastian Biraud	
Christopher	Chang	Chemistry	Our work in artificial photosynthesis addresses global challenges in climate change. We use design concepts from biology to develop molecular electrocatalysts for carbon dioxide capture and conversion and nitrogen/phosphorus cycling.	We develop catalysts for sustainable electrosynthesis to address climate change and rising global energy demands. Inspired by natural photosynthesis, which produces the value-added products needed to sustain life from light, water, and carbon dioxide, we use biological design principles to create synthetic molecular electrocatalysts for carbon dioxide capture and conversion as well as nitrogen/phosphorus cycling.
Doug	Clark	Chemistry	Doug Clark, Dean, College of Chemistry	
John	Coates	RCNR	Director, Energy Biosciences Institute	
William	Collins	LBNL, Berkeley	Associate Lab Director, Earth and Environmental Sciences Area at LBNL . Carbon Negative Initiative – both technological methods and enhancement of natural sinks	
Ethan	Elkind	Law	Director, CLEE Climate Program (Berkeley Law)	Capturing Opportunity: Law and Policy Solutions to Accelerate Engineered Carbon Removal in California (December 2020 report)

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Mary	Firestone	Soil Microbiology	Microbial processing of carbon and nitrogen underlie the capacity of soil to support plant growth in agriculture, rangeland, forests, and wetlands. However the extreme heterogeneity of soil and the scale at which microorganisms interact with their habitat has made understanding the ecology of soil microbes a challenge of long duration. The research done in the Firestone lab aspires to fundamental understanding as well as knowledge applicable to current problems including terrestrial system response to global change, sustainability, biodegradation, and soil structure.	
Dan	Kammen	ERG -	Kammen has conducted studies demonstrating that BECCS, combined with renewable energy deployment and fossil emission reductions, can enable a carbon-negative power system in Western North America by 2050.	
Kuno	Kasak	ESPM	Kasak's research interests include assessing the carbon and climate benefits of restoring degraded agricultural peat soils to managed wetlands. His work contributes to understanding the potential of wetland restoration in mitigating climate change.	
Trevor	Keenan	RCNR	Understanding the response of terrestrial ecosystems to climate variability and long-term change, as well as related feedbacks to the atmosphere through ecosystem carbon cycling and water use.	

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			Over the past two decades, Keenan’s work has focused on ecosystem carbon sequestration and long-term ecosystem dynamics, as well as related feedbacks to the atmosphere through water use and energy flows.”	
Lara	Kueppers	RCNR	Kueppers’ research focuses on ecological responses and feedbacks to climate change. She uses field experiments and observations, as well as computational models to understand climate-ecosystem interactions in the Western U.S. and tropics. Kueppers teaches courses on nature-based climate solutions and quantitative approaches to understanding environmental problems. She also has a Faculty Scientist appointment at Berkeley Lab.	Bark beetles tree mortality. Forests
Laurel	Larsen	Geography	Larsen’s expertise includes hydro-ecology, geomorphology, and restoration ecology. Her research encompasses wetland dynamics and restoration, with a focus on how wetlands process organic sediments and nutrients, influencing landscape evolution.	
Jeffrey	Long	Chemistry	Design and study of MOFs -- metal–organic frameworks—porous, inorganic solids built of metal nodes connected by organic linkers—for applications ranging from gas storage and molecular separations to catalysis and battery applications.	
Haiyan	Mao	Chemistry	Carbon removal — COFs and MOFs	

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Anastatios	Melis	Plant and Microbial Biology	Melis studies the photosynthesis of plants, microalgae, cyanobacteria, and photosynthetic bacteria. Approaches include biophysics and biochemistry of the process, molecular biology and genetics of the organisms, and scale ups for product generation. Applied aspects include diverting the flow of photosynthesis to generate high-value compounds instead of the normally produced sugars. Products of interest are biofuels, feedstock for the synthetic chemistry industry and pharmaceuticals. Our trademark is product generation directly from photosynthesis, bypassing the need to harvest and process the respective biomass.	
Peter	Nico	LBNL	Interim Division Director – Energy Geosciences Division <ul style="list-style-type: none"> • Enhanced weathering projects • Soil organic carbon processes • Carbon accounting models 	CA SGC-funded Working Lands Innovation Center — negative emissions on CA crop and rangelands
Kris	Niyogi	RCNR - Plant and Microbial Biology, Innovative Genomics Institute	The lab’s long-term research goals are to understand how photosynthetic energy conversion works in plants and eukaryotic algae, how it is regulated, and how it might be improved to help meet the world’s needs for food, fuel, and carbon sequestration to fight climate change. Niyogi investigates the molecular mechanisms of the oceanic biological carbon pump. His research focuses on how phytoplankton,	Plant Based CDR project “Technology enabled biological carbon capture and sequestration.” Chan Zuckerberg Initiative Foundation (Co-PI, with PI Brad Ringeisen and several other co-PIs). “Systems engineering of Auxenochlorella protothecoides: from photosynthesis to biofuels and bioproducts.” Co-PI, with PI Sabeeha Merchant

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			through photosynthesis, contribute to carbon sequestration in the ocean.	“RESTOR-C: RESTORation of soil Carbon by precision biological strategies.” Co-PI, with PI Susannah Tringe
Curt	Oldenburg	LBL	Geologic carbon sequestration with emphasis on modeling CO ₂ injection for enhanced gas recovery, and near-surface leakage processes and related risk assessment.	
Celine	Pallud	RCNR	Soil carbon removal and storage.	
Arun	Persaud	LBL	Measurement of soil carbon.	
Matthew	Potts	RCNR	Potts specializes in nature-based climate solutions. His work emphasizes optimizing carbon storage in forests through well-planned reforestation and restoration efforts.	Potts serves as the Chief Science Officer at Carbon Direct, a firm dedicated to comprehensive carbon management strategies.
Jeffrey	Reimer	Chemistry	Environmental protection, human sustainability, and fundamental scientific insights via materials chemistry, physics, and engineering. MOFs and other materials.	
Albert	Ruhi	ESPM	Ruhi’s research examines how freshwater ecosystems, including wetlands, respond to global change factors such as climate change and drought. His work aims to generate actionable knowledge to help preserve these vital ecosystems.	

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Daniel	Sanchez	RCNR	<p>Sanchez studies engineered biomass & bioenergy systems that remove CO2 from the atmosphere. Trained as an engineer and energy systems analyst, Sanchez’s work and engagement spans the academic, corporate, and governmental sectors.</p> <p>His research emphasizes the integration of BECCS with forest health treatments to achieve carbon-negative energy production.</p>	Sanchez runs the Carbon Removal Lab, which aims to commercialize sustainable carbon dioxide removal technologies, and supports outreach to policymakers and technologists in California and across the United States.
Corinne	Scown	LBNL	<p>Deputy for Research, Energy Analysis & Environmental Impacts Division</p> <p>Capture6 Project – Water Positive Carbon Removal – Removes CO2 from air while producing fresh water for communities.</p>	Lead techno-economic analysis for Capture6 project with big grant from CEC
Patrick	Shih	L&S Biological Sciences	Plant synthetic biology. Carbon removal and climate innovation.	
Whendee	Silver	RCNR	Soil ecology. The biogeochemical effects of climate change and human impacts on the environment, and the potential for mitigating these effects.	Silver is the lead scientist of the Marin Carbon Project, which is determining the potential for land-based climate change mitigation, particularly by composting high-emission organic waste for soil amendments to sequester atmospheric carbon dioxide. The Silver Lab was awarded the Innovation Prize by the American Carbon Registry (2015) for this work.
Margaret	Torn	LBNL	Investigates carbon cycling, particularly the interactions between soils and the atmosphere.	

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			Torn's work includes studying soil organic matter's role in carbon sequestration and the effects of environmental changes on greenhouse gas emissions from soils.	
Omar	Yaghi	Chemistry	Co-Director and Chief Scientist Bakar Institute of Digital Materials for the Planet (BIDMaP)	Breakthrough for CO2 capture and removal Chemistry Will No Longer Be Exclusive Work: How AI is Changing Omar Yaghi's Lab.
Peidong	Yang	Chemistry	Developing materials and systems for the purpose of fixing CO2 using sunlight.	