

CDR for Climate Interventions: Broadening Land to Earth System Interactions Science



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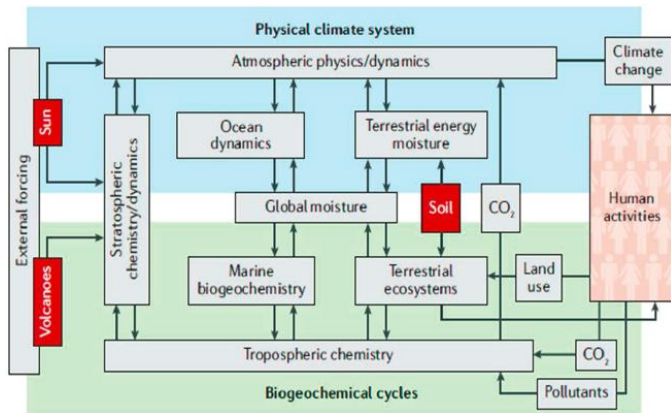
Metro DC • Boulder • Honolulu • Tuscaloosa • Seattle • Charleston • Wellington NZ

NATIONAL
ACADEMIES

Sciences
Engineering
Medicine

**Climate Intervention in an Earth Systems Science
Framework: A Workshop**

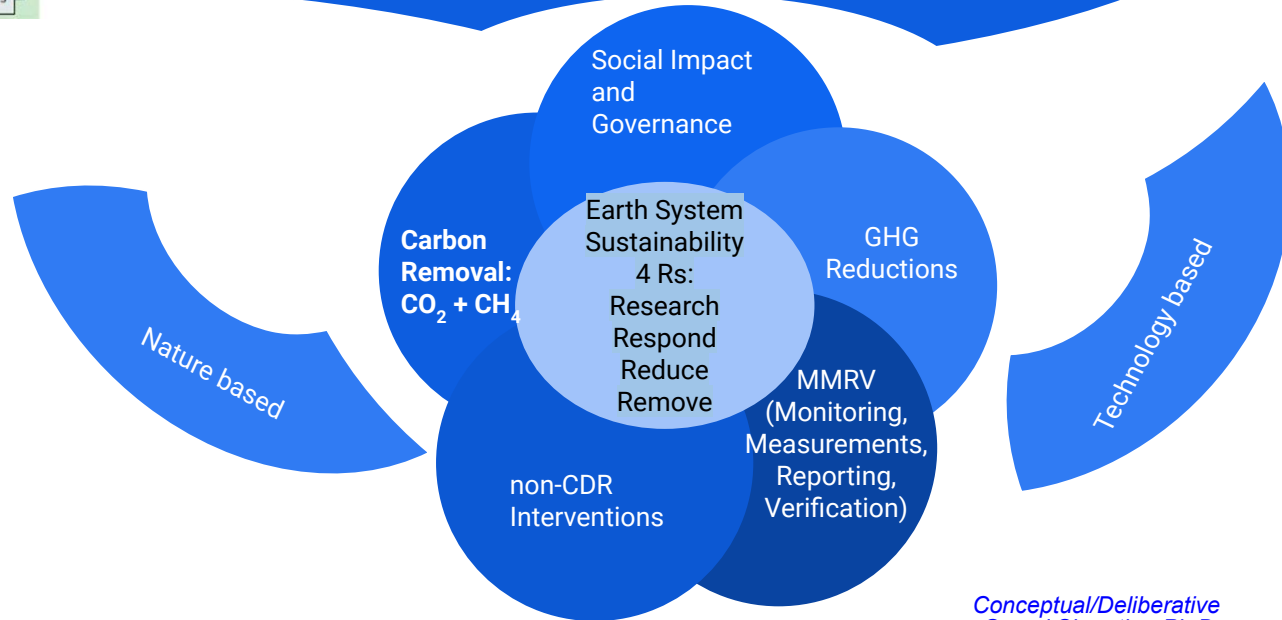
June 20 & 22, 2023

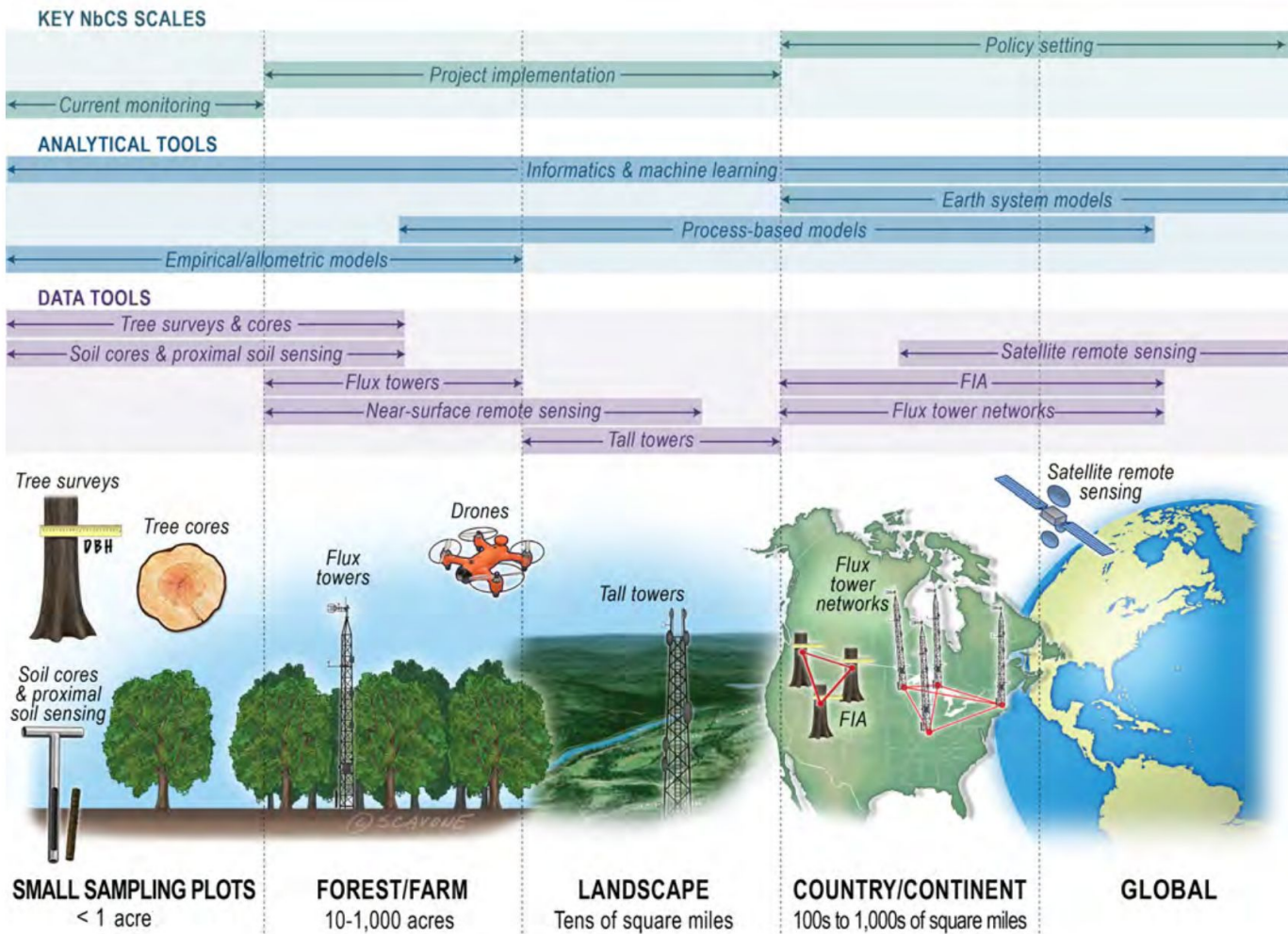


Bretherton conceptual model of the Earth System (1985)

Land ↔ Water ↔ Air ↔ Ocean ↔ Human Dimensions

Intervening with
Interdisciplinary Climate Solutions





We need to scale our capacity measurement, monitoring, reporting and verification of CDR and other climate interventions across all earth systems

Innovation, data and analytical tools to co-produce, inform solutions including CDR across terrestrial-coastal-ocean-societal interfaces

Example from: Novick et al. 2022. The science needed for robust, scalable, and credible nature-based climate solutions in the United States. <https://doi.org/10.5967/8rgp-tc11>.

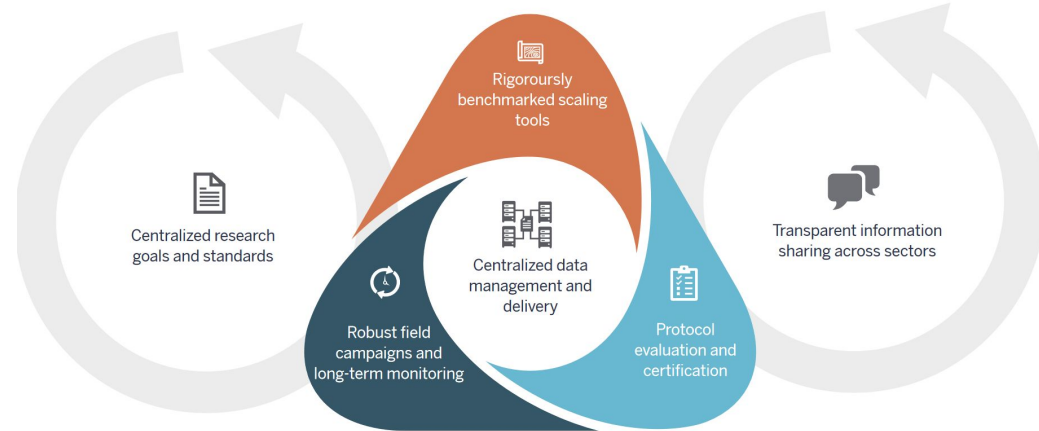
Next Generation: Broadening Land to Earth System Interactions Research



A next generation Earth Systems Science approach that explores interactions among natural and social processes that affect the Earth's capacity for sustaining life, now and in the future.

The six key characteristics of that integrated approach are as follows:

1. Advance both curiosity-driven and use-inspired basic research on the Earth's systems across spatial, temporal, and social organization scales.
2. Facilitate convergence of social, natural, computational, and engineering sciences to advance science and inform solutions to Earth systems-related problems.
3. Ensure diverse, inclusive, equitable, and just approaches to Earth Systems Science.
4. Prioritize engagement and partnerships with diverse stakeholders to benefit society and address Earth systems-related problems at community, state, national, and international scales.
5. Use observational, computational, and modeling capabilities synergistically to accelerate discovery and convergence.
6. Educate and support a workforce with the skills and knowledge to effectively identify, conduct, and communicate Earth Systems Science.



Novick, K., Williams, C., Runkle, B., Anderegg, W.R.L., Hollinger, D., Litvak, M., Normile, C., Shrestha, G., Almaraz, M., Anderson, C., Barnes, M., Baldocchi, D., Colburn, L., Cullenward, D., Evans, M., Guan, K., Keenan, T., Lamb, R., Larson, L., Oldfield, E., Poulter, B., Reyes, J., Sanderman, J., Selman, P., Sepulveda Carlo, E., Torn, M.S., Trugman, A., & Woodall, C. The science needed for robust, scalable, and credible nature-based climate solutions in the United States: Summary Report. DOI: <https://doi.org/10.5967/8rgp-tc11>. Available from <https://oneill.indiana.edu/faculty-research/research/climate/index.html>. (2022)

Interagency Carbon Dioxide Removal Research Coordination (I-CDR-C) Evolution



U.S. Carbon Cycle Science Program (USCCSP) established by Carbon Cycle Interagency Working Group (CCIWG)

1999

2018

USGCRP Annual Meeting interagency CDR needs, gaps, opportunities

2019

Sessions, town hall, presentations at AGU, NASEM etc.

2020

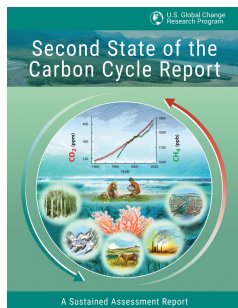
1st All Federal CDR Data Call

Federal CDR Data Call (Rolling), Analysis, Compendium, Publication(s), Public Engagement, Interagency Consultations, Workshops, CDR Academy, Technical WG, Funding Solicitations

2021-2022-2023

I-CDR-C Establishment

600+ entries, 19% NSF
> 70% land based



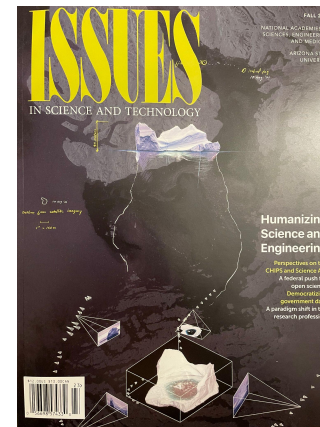
‘Changes in climate, human activities and ecosystem responses will alter the carbon cycle and future long-term removals of carbon by current land and ocean system sinks.

Understanding the mechanisms and consequences of such carbon cycle effects provides opportunities to make informed and innovative carbon management and policy decisions.’

Refer to: <https://carboncyclescience.us>
<https://carbon2018.globalchange.gov>
<https://nacarbon.org>



GYAMI SHRESTHA



Seeing the Big Picture in Carbon Removal Research

Shrestha, Gyami. "What Is the Big Picture in Carbon Removal Research?" *Issues in Science and Technology* 39, no. 1 (Fall 2022): 17–19. In <https://issues.org/carbon-dioxide-removal-research-coordination-gyami-shrestha/>

