Program Mission

To avoid the worst impacts of climate change, global carbon emissions must be reduced to net zero by mid-century. This scale of decarbonization requires massive transformations across all economic sectors as well as advances in sciences, technology, and business alongside changes in policy.

To integrate the next generation of leaders in the research solutions necessary to accelerate decarbonization, the Environmental Institute piloted the Decarbonization Corps.

Launched in the Summer of 2023, the Institute supported four unique faculty-led translational research projects conducted in conjunction with an outside organization (i.e., a practitioner) and supported by a student intern.

The Process

Four Decarbonization Corps projects were selected from a variety of proposals. UVA faculty focused on the types of innovative and entrepreneurial solutions to decarbonization needed to drive systemic change were encouraged to apply.

External collaborators and organizations were identified by UVA faculty or by the Environmental Institute. These organizations had a proven portfolio in collaboration surrounding the topic.

Upper-level undergraduates and graduate students from all disciplines applied and those selected were matched with projects in their fields of study and/or interest.

The Program

The Decarbonization Corps provided an inclusive and diverse experience, open to students from any discipline of study interested in solving some of the most challenging climate problems while also building skills necessary for jobs combatting climate change.

The program included a five-part seminar and networking event series. Developed and presented by the Environmental Institute, this series increased students’ awareness of the diverse research work at UVA and how faculty are moving research to action.

Speakers provided information on entrepreneurship resources at UVA, regional economic development, and state programs available to aspiring business owners working on climate solutions.
Cement is one of the most widely used construction materials in the industry and its production is responsible for 8% of global CO2 emissions. Developing low-carbon cement is an important step toward mitigating climate change.

A team of researchers, led by UVA faculty member Andres Clarens, has been developing a pour-in-place cement, “CarbonPour,” that is rich in both carbonates, which permanently sequester CO2, and crystalline calcium silicate hydrate (CCSH) phases, which provide strength and durability. The team worked alongside Ash Grove Cement.

Anusha Jain (Engineering 2025) worked with the CarbonPour team and Ash Grove Cement on formulating and testing novel cement materials. Her work involved characterizing these materials for compressive as well as tensile strength. Anusha is continuing to work with the CarbonPour team this academic year and is spearheading efforts to enter UVA in the 2024 American Society of Civil Engineers’ annual concrete canoe competition.

Pilot-level production of CarbonPour provides valuable insights into the scalability and feasibility of creating and offering products on a larger scale.

UVA collaboration with Ash Grove Cement will help the company reach real-world construction demand and supply. Educational programs and outreach initiatives help foster awareness about the importance of low-carbon cement in sustainable construction.
The U.S. Health Care Sector is responsible for 8.5% of U.S. greenhouse gas emissions. Much of those emissions are created indirectly from suppliers of products and services used by hospitals, known as Scope 3 emissions. However, despite the large impact, there are very few studies detailed enough to identify the specific activities and emissions contributing to these carbon emissions. As a result, the total carbon footprint of a hospital (both direct and indirect) has yet to be calculated, making impactful mitigation solutions hard to propose.

A team, led by Dr. Matthew Meyer with UVA Medical School, collaborated with Rho Impact and UVA faculty member Lisa Colosi Peterson to develop and create a generalizable framework and methodology for measuring Scope 3 emissions.

Overview

The U.S. Health Care Sector is responsible for 8.5% of U.S. greenhouse gas emissions. Much of those emissions are created indirectly from suppliers of products and services used by hospitals, known as Scope 3 emissions. However, despite the large impact, there are very few studies detailed enough to identify the specific activities and emissions contributing to these carbon emissions. As a result, the total carbon footprint of a hospital (both direct and indirect) has yet to be calculated, making impactful mitigation solutions hard to propose.

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The Outcomes

Anna Jett (Global Studies 2024) worked with this Decarbonization Corps team to develop Scope 3 accounting framework for UVA’s Ivy Orthopedic Center. The team determined the project boundaries and relevant Scope 3 categories, and developed an estimation method to collect data for CO2 emissions. Over 20 UVA personnel were engaged in the process.

The team hopes to complete a Scope 3 inventory and analysis of the Ivy Orthopedic Center in the winter of 2024.

The Future

The methodology developed in this Decarbonization Corps project could be translated to other medical facilities to enhance the accuracy and depth of estimation methods of Scope 3 emissions. This framework can be generalized for broader use across the U.S. in different types of hospitals and health systems.
Forests have been seen as a key element in the carbon market and nature-based solutions to decarbonization. Forest and land-use-related carbon market transactions have been steadily increasing, reaching $1.3 billion USD in 2021.

The success of the market depends on accurate and verifiable carbon accounting; however, traditional methods to estimate forest carbon are uncertain and may even contribute to net carbon emissions rather than net carbon gain.

To address this, UVA professor Xi Yang has developed a drone-based surveying technology that uses Terrestrial Laser Scanning (TLS) to provide unprecedented details of a tree. TLS allows researchers to estimate the total biomass of a tree with greater accuracy and, from that, carbon stocks. The project will quantify forest carbon at a Virginia site, the Oakencroft Farm.

Over the summer Maggie Cox (Environmental Sciences) used a drone to collect data on notable trees at UVA, which were then cataloged in an online database. This project refined the survey technology previously used to increase precision in estimating carbon stocks in trees.

Oakencroft Farm provided a base to scale the use of drone-based carbon accounting to gain credit for voluntary carbon sequestration. Success at Oakencroft Farm could open broader avenues for carbon offsets and potentially position the farm to pursue a federal grant for forest carbon accounting.

The project will be extended to create a virtual tour of UVA’s oldest trees and will estimate the biomass and carbon stocks. Such an innovative tour of UVA’s oldest trees is an accessible and educational approach to showcase forest carbon accounting and how it plays a role in mitigating climate change.
Seagrass meadows are marine ecosystems found along the coasts of nearly all continents. They are widely considered to be among the most productive ecosystems in the world. Seagrasses provide a range of ecosystem services including fisheries habitat, water quality improvement, and shoreline protection. Seagrass meadows also sequester carbon, potentially for decades to centuries, contributing to nature-based decarbonization.

Mark White from UVA’s McIntire School of Commerce, Kylor Kerns from Environmental Sciences, and Maria Camacho Fernandez from The Nature Conservancy (TNC) worked as a team to quantify and value carbon sequestration services provided by seagrass meadows in the Virginia Coastal Reserve.

The Outcomes

Yirui Gui (Economics, Political and Social Thought, 2023) worked with the team to apply The Natural Capital Project’s InVEST model to measure carbon sequestered in the seagrass meadows of the Virginia Coast Reserve. This InVEST Blue Carbon model quantifies the value of carbon storage and identifies where on the seascape there are net gains or losses in carbon over time. This provides valuable information for management, conservation and restoration about how to maximize the value of seagrass meadows as natural decarbonization solutions.

The Future

Insights from this project have improved the overall valuation of carbon sequestration benefits of seagrass restoration in the Virginia Coastal Reserve. This site will soon host the world’s first verified carbon offset project for seagrass restoration. The InVEST model can be refined and expanded for seagrass meadows in the Chesapeake Bay and other regions.
Based on the success of this pilot program, we envision enhancing the Decarbonization Corps in the following ways:

- Support individual projects of longer duration by extending summer intensive experiences with work-study during the academic year;
- Run sequential internships over multiple years with key partners to build long-term relationships;
- Provide professional development to interns through regular programming including workshops and seminars on, for example, entrepreneurship, job skills, and career development.

The Decarbonization Corps contributed meaningfully to the Institute’s capacity for translational research. The University has been supportive of this model connecting research to action, and faculty members have been engaged in the student experience through individual projects. Overall, the 2023 Decarbonization Corps program delivered powerful outcomes with many external partners.