

## COLLEGE OF EARTH, OCEAN, AND ENVIRONMENT STRATEGIC PLAN

### Preamble

Our planet faces significant environmental challenges that threaten to undermine the economic well being of our nation and world. At every turn we are called upon to balance competing uses of resources, to ensure sustainable ecosystems, to restore and remediate systems damaged by current or past practices, and to mitigate and adapt to climate change.

The mission of the University of Delaware College of Earth, Ocean, and Environment (CEOE) is to advance understanding of Earth's natural systems and the interactions of humans with the environment through engaged interdisciplinary research, teaching, and outreach.

Understanding these challenges in the context of the complex relationships between living and non-living resources is fundamental to successfully addressing them and to developing workable solutions grounded in sound policy. The issues are multifaceted and demand innovative, interdisciplinary, and often international approaches that utilize cutting-edge technologies.

Universities will significantly affect the outcomes of these environmental challenges by providing data and understanding through research, by educating the next generation of citizens, and by providing information to all stakeholders through outreach. At the University of Delaware, the College of Earth, Ocean, and Environment (CEOE) is uniquely positioned to address the complex issues of earth and ocean systems through its interdisciplinary research and education programs. We seek to understand the processes that integrate physical, chemical, biological, geological, and human components of our planet's environments into a unified system. The faculty work and collaborate internationally across a wide range of disciplines to understand how our planet's systems are intricately connected and how humans can be better stewards locally, regionally, and globally. CEOE fosters boundary-crossing research and educational programs that explore our planet's earth, ocean, and atmospheric systems.

### CEOE Strategic Milestones

**Research.** To lead the exploration and understanding of integrated earth, ocean, and atmospheric systems demands the ability to think about questions in a global context and the intellectual flexibility to work across disciplinary boundaries. Multi-investigator initiatives and research clusters are increasingly recognized as the best approach to solving complex societal challenges. CEOE has a history and structure that facilitates cross-disciplinary initiatives, including natural science, engineering, social science, and policy perspectives as they relate to the environment.

[Lead Multi-Disciplinary Global Environmental Research Initiatives.](#) The oceans, atmosphere, and continents are intimately interconnected in ways that defy national borders. This is clearly depicted in Broecker's iconic image of the ocean conveyor belt or in images dating back to the time of Aristotle that illustrate the world's hydrological cycle. These interrelationships drive local, regional, and global climate which, in turn, impacts ecosystems (and, therefore, human populations) through altered weather patterns that change hydrological, ecological, and elemental cycles. Plate tectonics and

other earth processes drive volcanism, earthquakes, and the formation of mid-ocean ridges that are rich in minerals. Society uses the oceans, land, and atmosphere for power generation and transportation to sustain economic development. The complexity of these interactions and their scale necessitates a multidisciplinary, global approach for studying them.

Action. Collaborate with key research institutions around the world to facilitate global earth and ocean focused research initiatives and enhance UD's recognition world-wide.

Action. Collaborate with other UD units to strengthen research clusters that:

1. Solidify UD's areas of environmental strength and enhance the visibility of UD as a leader in the environmental research arena.
2. Advance UD's energy initiatives, particularly in the area of marine alternative energy (e.g., offshore wind, water currents) and innovative power management solutions. This includes an investment in the CEOE effort to provide alternative, sustainable energy sources for the Lewes campus.

**Education.** Students who will address environmental issues as part of the future workforce will benefit most from an education that enhances critical thinking, and includes opportunities to develop oral and written communication skills, to work in collaborations that are cross-disciplinary, and to think globally.

Develop innovative and interdisciplinary educational programs, including international programs, for undergraduate and graduate students in areas of earth, ocean, and atmospheric studies. CEOE will provide signature programs that broadly engage students and provide them with the opportunity to achieve a critical mass of disciplinary depth.

Action. Participate with other UD units to develop a distributed environmental curriculum that introduces **undergraduate** majors in both environmental science and environmental studies to common core requirements and then allows them to develop depth in specific concentration areas. Explore the development of an integrated undergraduate program of coursework and research that is more similar to our graduate programs and best exemplified by the NSF IGERT Program.

Action. Develop additional **undergraduate** programs of study focused on the marine and earth environment that incorporate innovative research partnerships and address topics from an interdisciplinary perspective.

1. Winter session study abroad opportunities that incorporate a significant research component into the experience (e.g., <http://oceanexplorer.noaa.gov/explorations/08bonaire/welcome.html>).
2. Semester-long study abroad programs (e.g., China through joint programs with Xiamen University and East China Normal University; Wales through a joint program with Cardiff University, New Zealand through a joint program with University of Waikato).
3. Semester-in-residence programming that takes full advantage of the field and research infrastructure available at the Sharp Campus in Lewes.

4. Collaborative programs around biology of the environment with the College of Agriculture and Natural Resources.
5. Innovative accelerated undergraduate-graduate opportunities such as 3+2 or 4+1 BS/MS programs.

**Action.** Develop **graduate** education clusters with other UD units around specific environmental themes (e.g., environmental microbiology, power generation from geophysical flows; ecological modeling) that leverage and unify University-wide research strengths. These graduate education cluster areas should prepare students for post graduate careers by facilitating international study, participation in internships outside of their core area, and curricula that transcend traditional department and college boundaries.

**Action.** Develop innovative executive Master's programs and/or certificate programs to meet the **post graduate educational needs** of that sector of the earth and ocean workforce that cannot accommodate a year-long absence from work to participate in a standard degree program. Programs should make use of technology, emphasize decision making, and introduce students to the global environment through targeted study aboard opportunities.

**Public Outreach.** To maximize outcomes, scientific results need to be translated into readily understandable terms and made widely available. The knowledge should be used to help educate the public, to assist policy makers in reaching informed decisions, to help catalyze business opportunities, and to provide feedback to define additional research needs.

[Develop well-funded, partnership-based public outreach activities that link constituents in Delaware and beyond with science-based information to facilitate informed outcomes.](#)

Outreach programs should have direct and measurable impacts on the state, region, or nation.

**Action.** Work with federal and state agencies and the private sector to develop local, regional, and national programs that help stakeholders make or save money; protect lives, reduce injuries, or minimize risks; protect and improve the environment; make informed decisions regarding growth management and land use; and enhance environmental literacy of citizens.

## Summary

The milestones and action items outlined above should be viewed in an integrated context and as a roadmap that takes advantage of the multi-dimensional synergies between interdisciplinary and global research, innovative educational programming, and public outreach. Leadership in global environmental research initiatives will clearly enhance the quality of undergraduate and graduate programs available to CEOE. Undergraduate programs here and at partner institutions abroad present ideal opportunities to broaden student engagement. Such programs will also serve to catalyze the development of graduate students as teachers and team leaders. Similarly, innovative postgraduate certifications and training will foster the transfer of CEOE knowledge base to the public and private sectors in Delaware and beyond.