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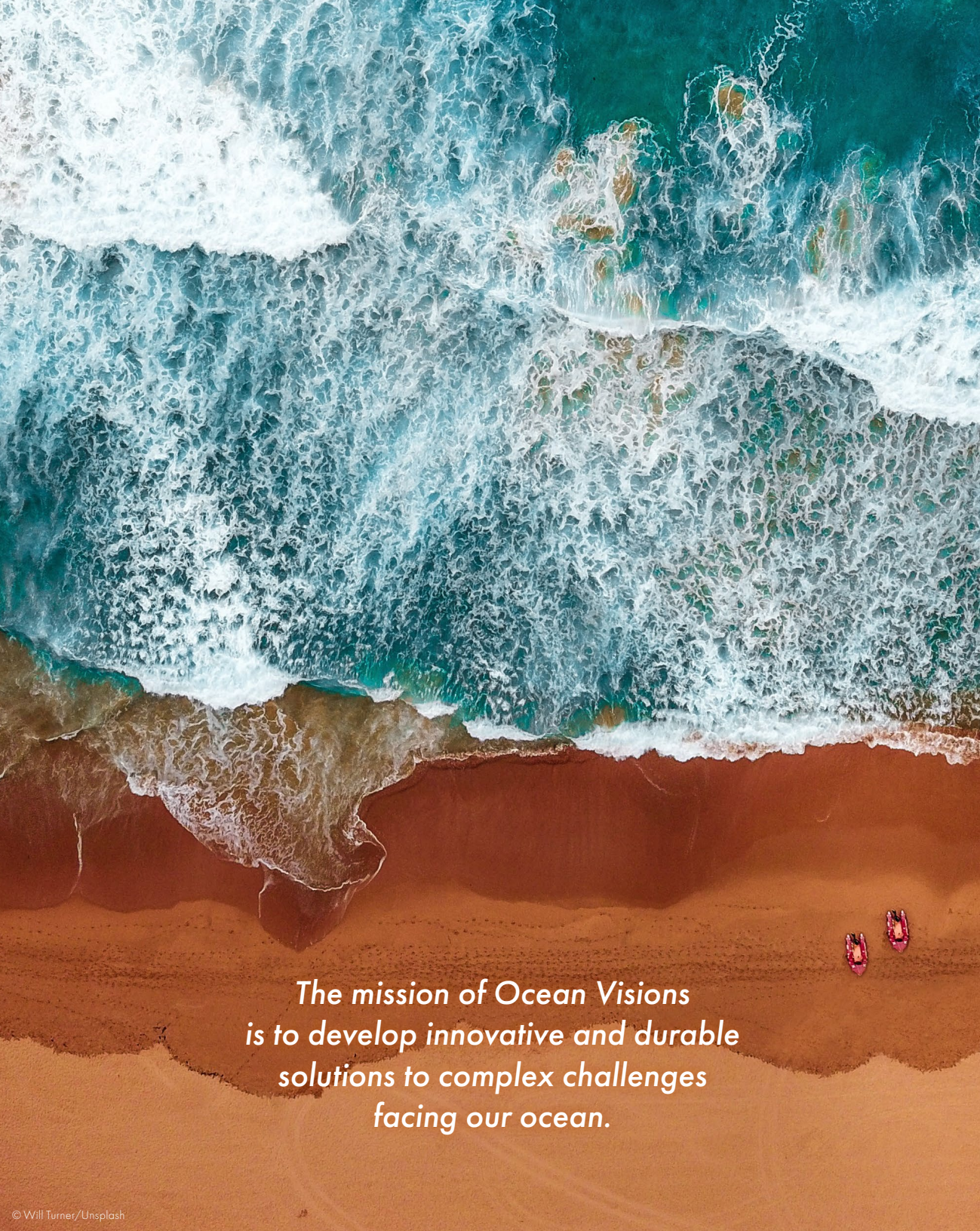
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*The mission of Ocean Visions  
is to develop innovative and durable  
solutions to complex challenges  
facing our ocean.*

# LETTER FROM THE EXECUTIVE DIRECTOR

## Dear friends and colleagues:

It is a great pleasure to share with you Ocean Visions' inaugural Annual Report. Since our formal incorporation in June of 2019, the organization has grown rapidly. I am proud of what we have been able to achieve so quickly in our development. We share many of these achievements with you in this report.



This first annual report also serves as an opportunity to reflect on why Ocean Visions was conceived and launched—and to recognize some of the key people that set the organization into motion.

While Ocean Visions was formally established in 2019, our story begins in 2017, when co-founder—and current board chair—Dr. Emanuele “Manu” Di Lorenzo decided that, as an academic, he wanted to use his positions to more directly support the creation of solutions to the mounting threats facing the ocean. Rather than continuing to improve our





precision at documenting ocean declines, Manu wanted to help channel the resources of academia to help invent, shape, and test the new needed solutions.

The Georgia Tech professor had just launched a new program in Ocean Science & Engineering and was determined to create a space wherein ocean-related scientific research would be applied in pursuit of real-world solutions.

Manu was not alone in this solution-oriented approach. Tapping into shared sentiment with other co-founders Fiorenza Micheli (Stanford University), Nancy Knowlton (Smithsonian Institution) and Mark Merrifield (Scripps Institution of Oceanography), he helped convene a group of leading ocean researchers from institutions that today represent our founding members. With further leadership from another co-founder, Martin Gray, the Georgia Aquarium helped to make the vision a reality by putting

their expertise and financial resources forward to launch Ocean Visions as a non-profit.

Leaders in the founding member institutions agreed that, too often, the diverse sectors and disciplines needed to design and advance effective solutions are siloed and disconnected, that academia needs to be more actively involved, and that a new structure could help to foster this. Ocean Visions was born of this recognition, with the mission to accelerate multisector and multidisciplinary collaborations to design, test, and develop new solutions at the ocean-climate nexus.

We honor all of these founders for their vision, and for their continuing contributions to the remarkable progress Ocean Visions has made in just a few short years.

Today, Ocean Visions has grown to become a Network of nearly two dozen members and partners, including not

only research and academic institutions, but also what we call our Acceleration and Impact Partners: investors, philanthropists, NGOs, marine managers, businesses, accelerators, and others that can help move promising solutions into scalable real-world applications.

To date, we have focused much of our strategic attention on the nexus between the ocean crisis and the climate crisis, in recognition of the inextricable linkage between the two. The idea of employing the vast power of the ocean to help ameliorate the climate crisis, which in turn is a prerequisite to improving ocean health, has been a trailblazing focus for this new organization.

This sharp focus has helped to galvanize critical funding, with important contributions from ClimateWorks Foundation, Grantham Environmental Trust, the Builders Initiative, Schmidt Marine Technology Partners, and others supporting what's now a staff of five and a large and growing cohort of expert advisors.

I hope that you'll find the organization's mission and progress as inspiring as I do. It is a gift to work alongside such a large number of bright, committed, and creative problem solvers.

Thank you for being part of this community, and for helping to create new space, opportunity, and positive recognition of the need to apply our collective ingenuity against the problems we face. Only together, and with new thinking and new tools, will we achieve our shared goals of a healthy ocean and a healthy climate.

Yours in a thriving ocean and repaired climate,

Brad Ack  
Executive Director & Chief Innovation Officer  
Ocean Visions

# WHO WE ARE

## Leadership

### Board of Trustees

**Emanuele Di Lorenzo**, Professor and Founding Director of the Program in Ocean Science and Engineering at the Georgia Institute of Technology (Board Chair)

**Martin Gray**, Chief Marketing Officer at Georgia Aquarium (Board Treasurer)

**Joe Handy**, President and CEO, National Black MBA Association

**Nancy Knowlton**, Sant Chair in Marine Science Emerita, Smithsonian National Museum of Natural History

**Fiorenza Micheli**, Co-Director of Stanford's Center for Ocean Solutions and of Hopkins Marine Station, and the David and Lucile Packard Professor of Marine Science at Stanford University

### Network Leadership Team

**Brad Ack**, Executive Director and Chief Innovation Officer at Ocean Visions

**Cassandra Brooks**, Assistant Professor in Environmental Studies at the University of Colorado Boulder

**Daniela V. Fernandez**, Founder and CEO of Sustainable Ocean Alliance

**John E. Fernández**, Professor and Director, Environmental Solutions Initiative, Massachusetts Institute of Technology

**Steve Gaines**, Dean of the Bren School of Environmental Science & Management at the University of California, Santa Barbara

**Alfredo Giron**, André Hoffmann Fellow at the Stanford Center for Ocean Solutions and the World Economic Forum Centre for the Fourth Industrial Revolution

**Chuck Greene**, Professor, Department of Earth & Atmospheric Sciences, Cornell University

**Paul Holthus**, Founding President and CEO of the World Ocean Council

**Namrata Kolla**, Product Manager at Allen Institute for Artificial Intelligence

**Emanuele Di Lorenzo**, Professor and Founding Director of the Program in Ocean Science and Engineering at the Georgia Institute of Technology

**Fiorenza Micheli**, Co-Director of Stanford's Center for Ocean Solutions and of Hopkins Marine Station, and the David and Lucile Packard Professor of Marine Science at Stanford University

**Rick Murray**, Deputy Director and Vice President for Research at the Woods Hole Oceanographic Institution

**Gwen Nero**,\* Director of Corporate Affiliates, Business Development, Industry Outreach, and Innovation at UC San Diego Scripps Institution of Oceanography

**Millicent Pitts**, Chief Executive Officer and Director, The Ocean Exchange

**Erin Satterthwaite**, Marine Ecologist, California Sea Grant at Scripps Institution of Oceanography

**Chris Scholin**, President and CEO, Monterey Bay Aquarium Research Institute

**Anna Zivian**, Senior Research Fellow at Ocean Conservancy

## Staff

**Brad Ack**, Executive Director & Chief Innovation Officer

**Emily Goldfarb**, Operations Manager

**Jessica Keith**, Communications Director

**David Koweeck, Ph.D.**, Science Director

**Nikhil Neelakantan**, Program Manager



\* Term ended in 2021

# OUR WORK IN 2021

## OCEAN-BASED CLIMATE SOLUTIONS

*Ocean Visions' program strategy is to engage scientists, managers, environmentalists, investors, business people, policymakers, and others to drive research, testing, and deployment of innovative solutions at the ocean-climate nexus. In what follows below, we provide further detail on a few of our signature initiatives in 2021.*

### Using the Power of the Ocean to Address the Climate Crisis: Road Maps for Ocean-Based Carbon Dioxide Removal

The largest and most dangerous threats to our global ocean comes from the excess of CO<sub>2</sub> and other greenhouse gas pollution that is disrupting our climate. In the ocean, this disruption manifests in three interconnected drivers of dangerous change: super-heating, deoxygenation, and acidification. Together, these pose a truly existential threat to our ocean and all life that depends on it. Reversing climate

disruption is the only durable path to reversing the ocean crisis, and, to do both, we must lower total accumulations of CO<sub>2</sub> in the atmosphere and the upper layer of the ocean.

In 2020–2021, Ocean Visions worked with experts from around the globe to co-create a series of road maps that identify the key priorities to advance in three large domains of ocean-based carbon dioxide removal (CDR). Ocean-based CDR approaches are modeled on existing biological and geological processes in the ocean that cycle carbon.

**The road maps are focused on three domains of ocean-based CDR of technology:**

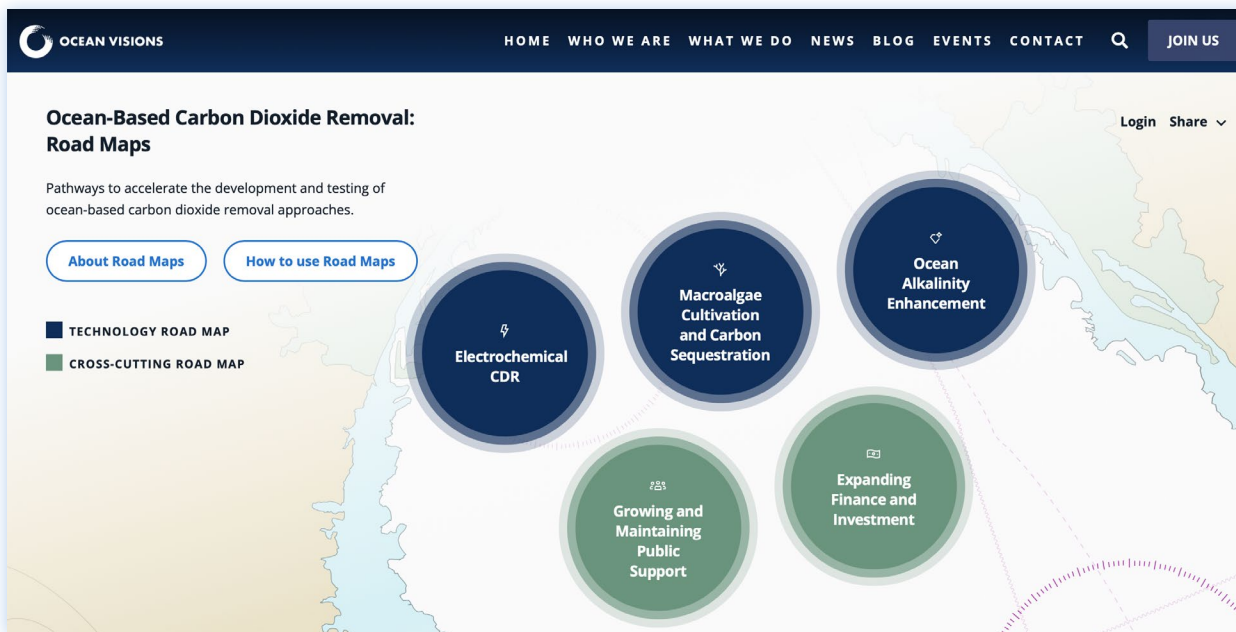
- » **Macroalgal cultivation and carbon sequestration:** Marine macroalgae (aka seaweed) have a tremendous potential for carbon sequestration capacity. Long-term storage could be achieved by transforming the biomass into products (fiber, biochar, plastics, etc.), using it as a source of renewable fuel, and/or sinking the biomass residues into the deep ocean.
- » **Ocean Alkalinity Enhancement:** Natural rock weathering, producing alkaline molecules that wash into the ocean, is the primary way by which Earth naturally removes and stores excess carbon dioxide over geological timescales. Ocean alkalinity enhancement technologies speed up this natural process to store carbon dioxide in the ocean and, at the same time, reduce ocean acidity.
- » **Electrochemical removal of carbon dioxide from seawater:** Sometimes called “direct ocean capture” to draw comparisons with direct air capture, this approach uses electrochemistry to remove carbon from seawater for permanent sequestration and/or produce alkalinity that can store carbon dioxide in the ocean by converting it to stable, long-lived bicarbonate.

In addition to the three technology road maps, two additional maps were developed on cross-cutting issues of importance: building and maintaining public support, and expanding finance and investment. All five digital road maps are now being used to catalyze global engagement on research and development and will be updated and refined regularly as advances emerge in science, technology, governance, and policy.

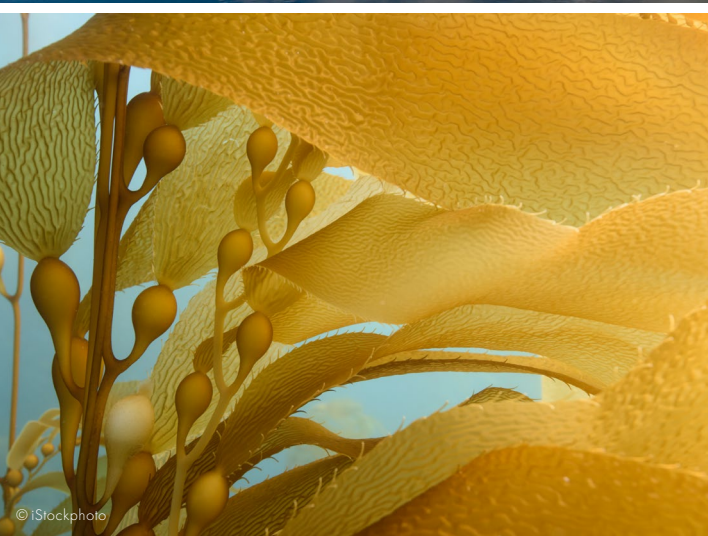


### DIVE DEEPER

► Explore & contribute to the road maps







## Advancing on Early Priorities Identified in the Road Maps

*While the road maps are designed to inform a global audience of researchers and practitioners and catalyze action amongst them, Ocean Visions also began directly taking on key priorities in 2021:*

### 1. Designing a Framework for Responsible Research on Sinking Seaweed for CO<sub>2</sub> Removal

Seaweed has been cycling carbon dioxide from the atmosphere into the deep ocean for millions of years, and studies show that wild, uncultivated seaweed is responsible for sequestering significant quantities of carbon in the deep ocean every year. Yet little is known about the fate and impacts of *intentionally* sinking seaweed for carbon sequestration, which is one of the key approaches contemplated in the road maps.

To address this knowledge gap identified as a key priority in the macroalgae roadmap, Ocean Visions and the Monterey Bay Aquarium Research Institute (MBARI) are convening an expert working group to develop a globally applicable research framework to investigate the quantities and permanence of carbon storage, as well as the environmental impacts, from intentionally sinking seaweed biomass to the ocean bottom.

Consisting of scientists, engineers, technologists, entrepreneurs, environmental managers, conservationists, and other relevant actors, the working group's charge was to identify knowledge gaps regarding the fate and environmental impacts of sinking seaweed, develop template field experiments that can address these knowledge gaps, estimate the costs of these template experiments, and develop asset inventories to highlight available scientific resources to support these studies.

### 2. Advancing Knowledge of Ocean-Based Carbon Dioxide Removal Through the Study of Natural Analogues

A key need that emerged through the development of the road maps is to better understand some of the natural ways the ocean already is cycling carbon to the deep ocean. ClimateWorks Foundation, a leading global platform for climate philanthropy, partnered with Ocean Visions to identify and fund research projects to study ocean-based CDR natural analogues—defined as existing marine settings that remove CO<sub>2</sub> from the atmosphere via processes that could theoretically be replicated, accelerated, and scaled.

ClimateWorks and Ocean Visions released a Request for Proposals in summer 2021. After a structured multi-tier review process by experts in the Ocean Visions Network of nearly fifty applications, two awards totaling \$440,000 were granted to 1) University of Washington's School of Oceanography, the U.S. Geological Survey, and the Prince William Sound Science Center, and 2) Woods Hole Oceanographic Institution for the following projects:

- » **CO<sub>2</sub> Uptake Via Chemical Weathering of Glacial Particles in the Ocean:** Led by the University of Washington's School of Oceanography, the U.S. Geological Survey, and the Prince William Sound Science Center, this project will measure the rate of alkalinity addition from mineral weathering under real-world seawater conditions at the fjords of Prince William Sound, where multiple glaciers naturally discharge fine-grained aluminosilicate particles into the ocean.
- » **Assessing Ocean Alkalinity Enhancement Through the Seasonality of the Mississippi River Alkalinity Flux:** Led by the Woods Hole Oceanographic Institution, this project will explore the implications of the naturally occurring seasonally enhanced alkalinity flux from the Mississippi River to the Gulf of Mexico and investigate the impacts of elevated alkalinity delivery to the ocean.



## PROVIDING EXPERT ADVICE & EVALUATION OF INNOVATIVE OCEAN SOLUTIONS

*Ocean Visions provides direct technical assistance for, or third-party evaluation of, innovations at the ocean-climate nexus. In partnership with the Jeremy and Hannelore Grantham Environmental Trust, Ocean Visions fields teams of experts to provide independent advice and assistance on research, development, field testing, impact analysis, and optimization. 2021 saw the launch of two advising teams, and a framework to work with more.*

### Running Tide Technologies, Inc

Running Tide Technologies, Inc is a company that specializes in high-tech aquaculture and has also developed a proprietary technology to grow seaweeds (macroalgae) in the open ocean with the intent of sequestering carbon. Ocean Visions assembled an Expert Team to provide external, third-party advice and review of Running Tide's research plans and an evaluation of all findings that come from their field testing.



#### DIVE DEEPER

► Learn more & read the progress report

### Safe Elevation of Alkalinity for the Mitigation of Acidification Through Electrochemistry (SEA MATE)

SEA MATE is an audacious pilot spearheaded by the College of Engineering and Applied Sciences at Stony Brook University to develop an electrochemical approach to directly mitigate ocean acidification and enhance ocean carbon sequestration. SEA MATE is exploring the restoration of ocean chemistry through the electrochemical removal of acid which, in the process, will capture atmospheric carbon dioxide in the ocean in the stable form of bicarbonate. An Expert Team convened by Ocean Visions is advising the design and analysis of laboratory and field experiments, as well as supportive computer modeling, to help evaluate the efficacy of the SEA MATE approach to remediate ocean acidification and

sequester atmospheric carbon dioxide within safe operating conditions.



#### DIVE DEEPER

► Learn more about SEA MATE

### Ocean Visions Launchpad

The \$100 Million XPRIZE Carbon Removal, funded by Elon Musk and the Musk Foundation and the largest incentive prize in history, is aimed at fostering technologies that can remove massive quantities of CO<sub>2</sub> from the biosphere. The four-year global competition invites innovators and teams from anywhere in the world to create and demonstrate solutions that can pull carbon dioxide directly from the atmosphere or oceans and sequester it durably and sustainably.

Ocean Visions created a new program to advise select competitors using ocean-based approaches through the Ocean Visions Launchpad. We will work with the selected competitors to identify the specific technical and disciplinary expertise, as well as key physical resources (such as testing facilities, vessels, and labs), that they most need to enhance their ability to compete. Ocean Visions will then recruit appropriate experts from within its Network to build customized teams from relevant disciplines and expertise. These advisory teams will provide ongoing technical advice and support over 12-24 months, without charge to the teams.



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© Running Tide



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## BUILDING AN OCEAN SOLUTIONS COMMUNITY

*Ocean Visions mobilizes and activates a diverse community of problem solvers to tackle the most pressing challenges facing the ocean.*

### Global Ecosystem for Ocean Solutions (GEOS)

The Global Ecosystem for Ocean Solutions (GEOS) is a collaborative effort led by Ocean Visions to extend our model more internationally, and build a vibrant, global community of researchers, innovators, investors, decisionmakers, and other stakeholders linked by an interest in ocean solutions. Endorsed in June 2021 by the United Nations Decade of Ocean Science and Sustainable Development as an official Decade Program, GEOS provides an enabling framework to help catalyze the co-design, development, and deployment of equitable, durable, and scalable ocean-based solutions for critical challenges at the ocean-climate nexus. Initial projects will focus on expanding engagement internationally in ocean-based carbon dioxide removal R&D, innovating climate adaptation solutions for coastal communities, and increasing focus on ocean-based food security.

 **DIVE DEEPER**  
▶ Learn more about GEOS

### COP26 Event: Putting CDR and Oceans on the Global Climate Agenda

On November 8, 2021, Ocean Visions, Thunderbird School of Global Management, the Government of Kenya, and a host of prominent speakers joined together in Glasgow, Scotland for a COP26 event on the power of global partnerships and the ocean in scaling carbon dioxide removal (CDR). The event featured the formal launch of the Global Carbon Removal Partnership and a deep-dive into road maps for ocean-based carbon dioxide removal.

 **DIVE DEEPER**  
▶ Listen to the session

### Video: Harnessing the Power of the Ocean to Restore the Climate

With support from ClimateWorks Foundation, Ocean Visions developed a one-of-a-kind video to introduce key audiences to the need to explore ocean-based solutions to climate change.

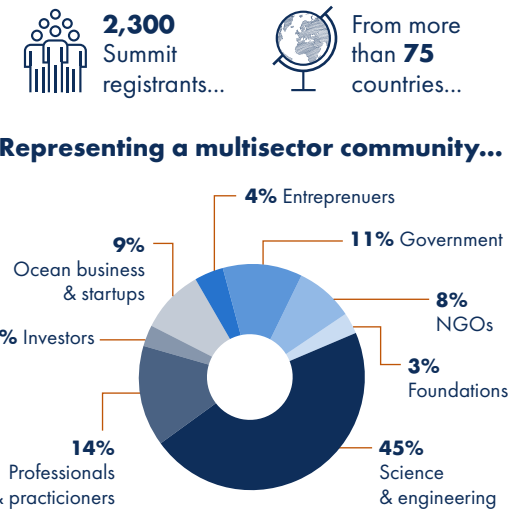
 **DIVE DEEPER**  
▶ Watch the video

### OCEAN VISIONS 2021 SUMMIT: Towards a Global Ecosystem for Ocean Solutions

The Ocean Visions 2021 Summit, held virtually from May 18–21, 2021, brought together a multisector community of researchers, innovators, decision-makers, funders and more to share insights and build connections around some of the greatest ocean challenges, including: ocean-based solutions to climate change, equitable coastal solution strategies for resilience and adaptation, marine circular economies, ocean and human health, and how to transform research from academia into sustainable businesses. The event brought together 2,300 people from more than 75 countries.

 **DIVE DEEPER**  
▶ Watch the event recordings

### Ocean Visions 2021 Summit BY THE NUMBERS



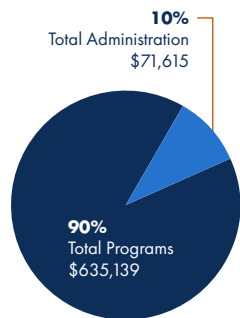


# FINANCIAL SUMMARY OCEAN VISIONS NETWORK

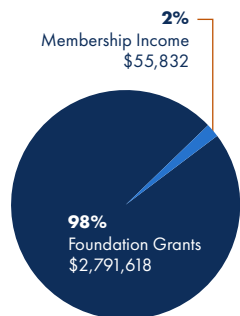
**OUR FUNDERS** Ocean Visions is grateful for the generous support it has received from the following: Builders Initiative, ClimateWorks Foundation, Jeremy and Hannelore Grantham Environmental Trust, Freemont Bank Foundation, Hopper Dean Family Fund and Schmidt Marine Technology Partners.

## Financial Summary

### 2021 Total Expenses



### 2021 Income\*



## Mission

The mission of Ocean Visions is to develop innovative and durable solutions to complex challenges facing our ocean.

## The Ocean Visions Network

The Ocean Visions Network links science and engineering resources from the research community with other key expertise to develop applied solutions that can ameliorate and reverse dangerous threats to the ocean. The Network is comprised of:

**Research Consortium** ▶ Leading ocean research and academic institutions that help identify, develop, evaluate, and test solutions to ocean challenges



UC SANTA BARBARA



**Acceleration and Impact Partners** ▶ Investors, philanthropists, NGOs, businesses, accelerators, and others that help move promising solutions into scalable real-world applications

