

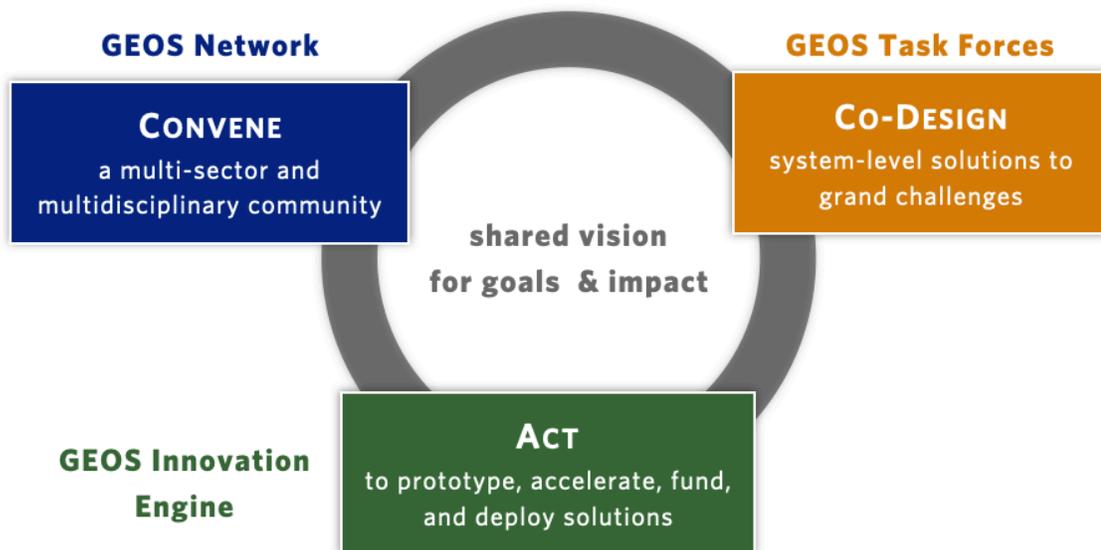
GLOBAL ECOSYSTEM FOR OCEAN SOLUTIONS (GEOS)

A “Programme” proposal for the United Nations Decade of Ocean Science for Sustainable Development

(FINAL, August 25, 2020)

Our goal is to “establish a vibrant, global ocean solutions community of researchers, innovators, investors, decision-makers and other stakeholders to co-design and co-deploy equitable, durable, and scalable ocean-based solutions for climate change and ocean grand challenges”

www.OceanSolutions.org



An ecosystem that enables synergistic alignment of **researchers, innovators, investors, decision-makers,** and other **stakeholders** towards transforming knowledge into equitable, durable, and scalable solutions

Executive Summary

The United Nations (UN) is launching the Decade of Ocean Science for Sustainable Development (2021-2030) *“to support efforts to reverse the cycle of decline in ocean health”*. The ocean research community understands ocean threats arising from climate change and the unsustainable use of ocean resources. However, because of disciplinary and sectorial siloes, this scientific knowledge has often failed to be transformed into scalable ocean solutions that support an equitable and sustainable blue economy, and help mitigate climate change.

To overcome the persistent gap between research and solutions, we envision establishing a **Global Ecosystem for Ocean Solutions (GEOS)** as a flagship Programme of the UN Ocean Decade. **The mission of GEOS** is to *“establish a vibrant, global ocean solutions community of researchers, innovators, investors, decision-makers and other stakeholders to co-design and co-deploy equitable, durable, and scalable ocean-based solutions for climate change and ocean grand challenges”*.

The GEOS strategy for action is **(1)** to deploy **new multi-sector processes** that enable the generation and transition of scientific knowledge into co-developed **ocean solutions (2)** to **address ocean grand challenges in climate change and the ocean** that require system level (e.g. multi-sector and interdisciplinary) use-inspired research and action.

To this end, the GEOS ecosystem is organized around three synergistic functions and pillars:

- **CONVENE:** Catalyze new knowledge and innovation through a **GEOS Network**, consisting of research, private, and public sector actors.
- **CO-DESIGN:** Co-create ocean solutions through multi-sector **GEOS Task Forces** that integrate innovations from science, technology, governance, and finance.
- **ACT:** Prototype, accelerate, fund, and deploy equitable, durable, scalable solutions through an ocean-focused **GEOS Innovation Engine** for a healthy society, ocean, and an equitable and sustainable blue economy.

The GEOS website will be hosted on <http://www.OceanSolutions.org>

To lay the foundation for the GEOS platform, we are developing a set of focused partnerships, with a particular focus on including leadership and participation of the Global South, among research universities and institutions, professional ocean-focused societies, NGOs, IGOs, foundations, financial institutions, and ocean innovation & solutions platforms all whom have a committed interest in ocean solutions.

The key to GEOS success is to break down the silos that exist among these organizations, thereby linking research, development, and deployment processes. Members of GEOS are committed to all stages of the research, design and deployment of solutions and have a shared vision around achieving equitable, scalable outcomes. Since a non-siloed, research-centered community for developing global

oceans solutions does not yet exist, we have first gathered a number of international research and education institutions with a strong focus in ocean science, policy, and engineering as part of the Ocean Visions and Future Seas initiatives to jump-start the GEOS community.

To implement GEOS, *Ocean Visions* and *Future Seas* have joined forces with international multi-sector coordinating partners: *IOC-UNESCO*, *Future Earth Ocean Knowledge-Action Network*, the *Early Career Ocean Professionals (ECOP)* network, *The Ocean Conservancy*, the *American Geophysical Union*, *The Oceanography Society*, the *North Pacific Marine Science Organization (PICES)*, *Ocean Exchange*, *Investable Oceans*, *AiiM Partners*, the *World Economic Forum Uplink*, and the *Ocean Impact Innovation (OII)* programme led by *OceanHub Africa* and the *Blue Ocean Partners*.

An international steering committee that includes representation from multiple countries and representation from the initial partnering groups has been established to further guide the development and implementation of the GEOS program, leveraging existing resources to maximize efficiency and inclusivity.

In this proposal, we provide specific recommendations for piloting GEOS and its co-design process by catalyzing this international community around a few grand challenges.

Table of Content

Executive Summary	2
1. Background and Motivation	5
<i>Overcoming the Barriers to Ocean Solutions at Scale</i>	<i>6</i>
2. The Global Ecosystem for Ocean Solutions (GEOS) “Programme”	6
<i>New Multi-Sector Processes</i>	<i>7</i>
<i>Grand Challenges and Ocean Solutions</i>	<i>8</i>
3. GEOS Functions for the Ocean Decade	9
<i>Core Value of GEOS</i>	<i>9</i>
<i>CONVENE – the GEOS Network</i>	<i>9</i>
<i>CO-DESIGN – the GEOS Multi-sector Task Forces</i>	<i>10</i>
<i>ACT – the GEOS Innovation Engine</i>	<i>11</i>
<i>GEOS Outcomes</i>	<i>12</i>
5. Leadership and Implementation Process.....	14
<i>Steering Committee & Contacts for GEOS Development Team</i>	<i>15</i>
References.....	17

1. Background and Motivation

*“The Ocean is the life source of our planet and vital for healthy human societies and a thriving world economy – our ally in the quest for a sustainable future. It covers 70% of the Earth's surface, is the planet's largest biosphere, and is home to 50-80% of all life on Earth. **Yet this foundation for life is under serious threat.**” – High Level Panel for a Sustainable Blue Economy*

Until recently the ocean has been considered an inexhaustible and resilient resource that was simply too big to fail (*Lubchenco and Gaines 2019*). However, the pressures of climate change and unsustainable economic development (e.g. rising ocean temperatures and sea level, acidification, de-oxygenation, marine pollution, overfishing, and others) pose major threats to ocean health with negative impacts on coastal communities, marine ecosystem services, the global economy, and human health, safety and well-being of billions people. Recent reports from the Intergovernmental Panel on Climate Change (*IPCC AR5 Report, 2014; IPCC Special Report 2018*) and the ocean High Level Panel (*Hoegh-Guldberg, O., et al. 2019*) make it clear that the ocean must be a critical part of global efforts to limit climate change.

The UN Decade of Ocean Science for Sustainable Development and the SDGs represent an unprecedented opportunity for changing the unsustainable “business-as-usual” trajectory. Ocean-based solutions hold huge potential for addressing the global grand challenges related to climate change (*Hoegh-Guldberg, O., et al. 2019*), food and nutritional security (*Costello et al., 2019*), and public health (*Kite-Powell et al., 2008; Flemming et al. 2019*).

The ocean research community has long understood the current ocean threats and crisis. However, because of disciplinary, sectorial and geopolitical siloes, this scientific knowledge has often failed to be transformed into scalable ocean solutions that support a sustainable and equitable blue economy and help mitigate climate change.

To overcome the persistent gap between research and solutions, we propose establishing a **Global Ecosystem for Ocean Solutions (GEOS)** as a flagship Programme of the United Nations Decade of Ocean Science for Sustainable Development.

The mission of GEOS is to:

“establish a vibrant, global ‘ocean solutions’ community of researchers, innovators, investors, decision-makers, and other stakeholders to co-design and co-deploy equitable, durable, and scalable ocean-based solutions for climate change and ocean grand challenges.”

Such an integrated, global, inclusive community currently does not exist for ocean solutions and most efforts remain fragmented and scattered with an inability to reach a system-level approach to solutions.

Overcoming the Barriers to Ocean Solutions at Scale

There are a number of elements needed to bridge the current gap between research capacity and ocean solutions. These include:

- **An Interdisciplinary, Multi-Sector, Inclusive 'Ocean Solutions Community'** focused on transforming research into action, and informed by users' solution needs (i.e., "use-inspired research").
- **A Trusted and Recognized Forum** that brings together researchers, innovators, investors, decision makers, and other stakeholders into an ocean solutions global community.
- **Multi-Sector Processes to Co-Design Ocean Solutions** that integrate innovators and innovations from the sciences, technology, business, governance, and finance.
- **Access to an Integrated Knowledge Base** of science (both natural and social), indigenous knowledge, and engineering that enable ocean solutions and sustainable businesses at scale.
- **Broader Participation** from youth, early career ocean professionals, women, underrepresented communities, and developing nations.
- **An Ocean-focused 'Innovation Engine'** that allows efficient and rapid proto-typing and deployment of solutions that address critical threats to ocean health, support the sustainable and equitable development of the Blue Economy, inform ecologically-sound management of ocean resources, ocean-based climate mitigation and adaptation, and engage people and society in the stewardship of the ocean.

2. The Global Ecosystem for Ocean Solutions (GEOS) "Programme"

The past decade has seen significant advances in ocean sciences and ocean action, both through collaborative networks and initiatives. The next decade needs to bring these distinct communities together to enable much greater and more rapid progress and amplify and scale actionable ocean solutions.

To accomplish its mission, GEOS is developing a focused partnership among research universities and institutions, professional ocean-focused societies, NGOs, IGOs, foundations, business and financial institutions, and ocean innovation and solutions platforms, all of which have a committed interest in ocean solutions.

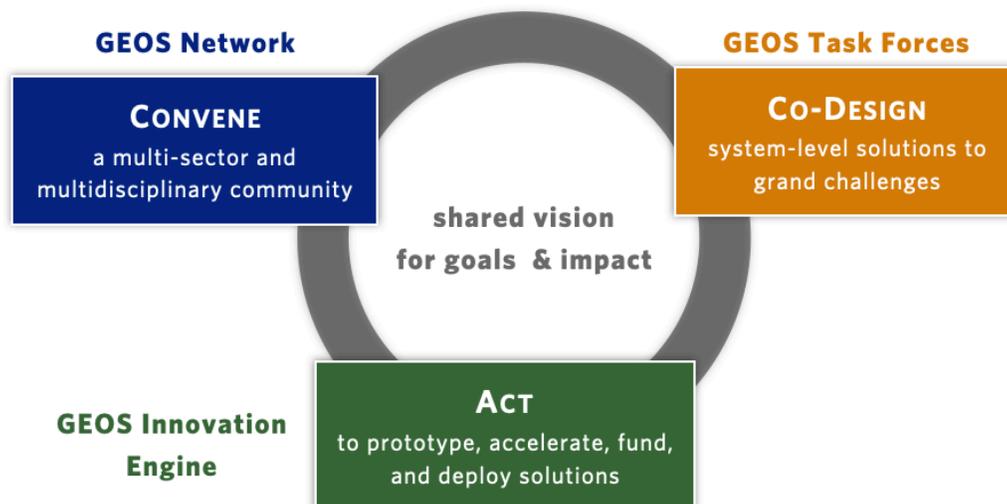
The GEOS strategy for action is **(1)** to deploy **new multi-sector processes** that enable the generation and transition of scientific knowledge into co-developed **ocean solutions (2)** to **address**

grand challenges in climate change and the ocean that require system level (e.g. multi-sector and interdisciplinary) use-inspired research and action.

New Multi-Sector Processes

The key to GEOS success is to break down the silos that exist among research universities and institutions, professional ocean-focused societies, NGOs, IGOs, foundations, business and financial institutions, and ocean innovation and solutions platforms, thereby linking research, development, and deployment processes within a unified framework. To this end, the GEOS ecosystem is organized around three synergistic pillars:

- **CONVENE:** Catalyze new knowledge and innovation through a **GEOS Network**, consisting of research, private, and public sector actors.
- **CO-DESIGN:** Co-create ocean solutions through multi-sector **GEOS Task Forces** that integrate innovations from science, technology, governance, and finance.
- **ACT:** Prototype, accelerate, fund, and deploy equitable, durable, scalable solutions through an ocean-focused **GEOS Innovation Engine** for a healthy society, ocean, and an equitable and sustainable blue economy.



An ecosystem that enables synergistic alignment of **researchers, innovators, investors, decision-makers**, and other **stakeholders** towards transforming knowledge into equitable, durable, and scalable solutions

Grand Challenges and Ocean Solutions

Using the GEOS approach and functions, over the next decade we anticipate making significant progress on solutions to five of the **ocean's grand challenges**. These are:

- **Ocean-based solutions to the climate crisis** (e.g. ocean carbon dioxide removal, alkalinity enhancement, decarbonizing shipping, oceanic renewable energy, nature-based solutions based in ecosystem protection, management and restoration)
- **Resilience and adaptation of coastal systems and communities to global disruption** (e.g., mitigation and adaptation to sea level rise and extreme events, coastal habitat protection and restoration, green-grey infrastructure)
- **Ocean-based food security** (sustainable aquatic food production through fisheries and aquaculture, ensuring availability and access to aquatic foods to combat malnutrition)
- **Countering marine biodiversity loss** (e.g., reversing loss of biodiversity through protected areas, including in the high seas, protection and restoration of critical ecosystems, reducing threats and cumulative impacts from climate change, resource exploitation, invasive species, and pollution)
- **Greening the direct human footprint on the ocean** (e.g. sustainable tourism, ocean-based businesses).

3. GEOS Functions for the Ocean Decade

The GEOS Programme is in alignment with the Ocean Decade’s four key objectives and puts into action critical processes for co-designing and transforming knowledge into ocean solutions. Specifically, GEOS is directly aligned with the **Criteria (C1-4)** and **Attributes (A1-4)** required for the UN endorsement of Decade actions summarized in the **Table** below.

Decade Action Endorsement	
Proposed Actions will need to:	
C-1	Contribute to achieving the Decade objectives and the associated strategic orientations. ✓
C-2	Accelerate the generation of knowledge and understanding of the ocean. ✓
C-3	Enable the uptake of science and ocean knowledge at societal and policy levels. ✓
C-4	Ensure that all data and resulting knowledge are provided in an open access, shared, discoverable and are deposited in recognized data repositories. ✓
Actions should also include:	
A-1	Multi-country, Multi-actor Partnerships. ✓
A-2	Capability and capacity development, including to beneficiaries in Small Island Developing States (SIDS) and Least Developed Countries (LDCs). ✓
A-3	Gender, generational, and geographic diversity. ✓
A-4	Integration of local and indigenous sources of knowledge. ✓

In this section we outline the main components and functions of GEOS and label them to highlight how they meet the **criteria** and **attributes** of the ocean Decade. The role of the **coordinating partners** is also highlighted.

Core Value of GEOS

GEOS strives to cultivate a diverse, equitable, just, and inclusive community of researchers and practitioners around the world focused on solutions for a healthy and sustainable ocean. We aim to provide an inclusive voice for the role of ocean solutions in addressing societal needs (**A-1, A-2, A-3, A-4**). These core values are shared across the ecosystem components of GEOS described below.

CONVENE – the GEOS Network

We will convene a multi-sector and multidisciplinary ocean solutions community, the **GEOS Network**, consisting of members from the academic research, private, and public sectors (**A-1**), and host a trusted forum for transforming research into solutions and actions that address real needs of stakeholders, decision-makers, and society (**C-1, C-2, C-3**). Through the **Early Career Ocean Professionals (ECOP) network**, all activities of the GEOS Network will prioritize the engagement and mentorship of younger generations, early career ocean professionals, and underrepresented communities (**A-2, A-3, A-4**).

Specific actions of the GEOS Network include:

- **Ocean Solutions Global Summit.** *Ocean Visions, Future Seas, AGU, TOS, PICES, ICES, IMBER, MTS, EGU,* and *ASLO* will lead the implementation of a recurrent week-long international ocean solutions meeting and virtually concurrent events that will be co-hosted in multiple locations around the globe to expand participation and cut the event's carbon footprint. A first meeting, the Ocean Visions Summit, is scheduled for May 17-20, 2021 (**A-1, C-1, C-2**).
- **Integrated Ocean Solutions Knowledge Base.** *Frontiers of Marine Sciences (FMARS)* together with *Ocean Visions* will continue to curate the new (and first of its kind) open access special section *Ocean Solutions* in FMARS. Special publication rates will be available for the GEOS network members. Other journals may be launched as the GEOS effort progress.
- **Access to Domain Experts and Peer Review of Ocean Solutions.** The GEOS network will also set up a new portal to allow the broader community (e.g., innovators, investors, businesses, etc.) to request (1) access to domain experts (**C-2, C-3**) and (2) peer review of the science, technology, governance, and finance elements of new proposed solutions.
- **Special Sessions and events.** Organizations participating in GEOS will also prioritize holding focused sessions on ocean solutions at their annual meetings, allowing the GEOS Network to expand and connect. These include the annual meetings of *PICES, ICES, IMBER, AGU, Ocean Visions, Future Seas, EGU,* and *ASLO*.

CO-DESIGN – the GEOS Multi-sector Task Forces

To co-create ocean solutions that integrate innovations from the sciences, technology, business, governance, and finance, we will establish dynamic processes that bring together researchers, innovators, investors, stakeholders, NGOs, and decision-makers. We anticipate developing a set of **GEOS Multi-Sector Task Forces** to develop actionable roadmaps for designing and implementing solutions (**C-1, C-2, C-3, A-1-4**).

The development and aim of the task forces (or equivalent action/working groups) will be community-driven from the GEOS Network and will be further developed through the implementation planning of GEOS under the guidance of NGOs and IGOs such as the *Ocean Conservancy* and the *IOC-UNESCO*. A one-day workshop for the implementation plan of GEOS is scheduled during the Ocean Visions 2021 Summit.

The co-design process is an important synergistic process to link the GEOS Network to the GEOS Innovation Engine. Examples of pilot co-design processes already ongoing are:

- **Task Force on Ocean-Based Carbon Dioxide Removal (CDR).** Funded by the *ClimateWorks Foundation* and the *Grantham Environmental Trust* and coordinated through *Ocean Visions*, this task force has already begun its work to identify critical paths forward to accelerate

assessment, development, testing, and deployment of ocean-based CDR.

- **Virtual Action Groups on Marine Plastic and Illegal Fishing.** Supported through the digital platform *Uplink of the World Economic Forum*, these online action groups are another pilot for bringing together researchers, innovators, and investors.
- **Joint Working Groups on Fisheries and Climate.** Sponsored by *PICES* and *ICES*, these aim at providing stakeholders and decision-makers with actionable information to manage global fisheries under the uncertainties of climate change.
- **Task Force on Coastal Solutions for Climate Adaptation and Resilience (CDR).** Coordinated through the *Ocean-Climate Platform* and *Ocean Visions* and *CoastsPredict*, this task force has already begun their planning process for advancing solutions-driven research and applications for coastal communities.

Building on pilots such as the one above, GEOS we will bring more international coordination to focus on grand challenge ocean solutions and visibility under the UN programme (**C-1, C-3, A-1**).

ACT – the GEOS Innovation Engine

To transform the GEOS knowledge pipelines into innovation and partnerships to scale solutions, GEOS will integrate and coordinate the convening and co-design efforts with the **GEOS Innovation Engine**.

This “engine” will be comprised of existing networks of incubators, accelerator programs, hybrid innovation platforms, and funds that are focused on ocean solutions. **We refer to this system of relationships as the GEOS Innovation Engine.** This will support the creation of technologies, innovations and businesses that can be used to drive new company development for sustainable economic growth and livable wages in all global regions, to inspire and support young researchers and entrepreneurs to explore careers in ocean technologies, to be adopted by existing organizations in the oceans space, and/or adopted by decision makers (elected officials and ocean and coastal managers) at different scales (**C-2, C-3**).

The development and connectivity of the GEOS Innovation Engine will rely on key partner program and organizations such as: the *Ocean Exchange*, *AiiM Partners*, the *World Economic Forum through Uplink, Investable Oceans*, and the partner UN developing programme *Ocean Impact Innovation (OII)* led by *OceanHub Africa*, the *Blue Ocean Partners*, *Katapult Ocean*, and the *High Level Panel for a Sustainable Ocean Economy*. The integration of activities and mechanisms will be developed through a shared process that will begin at the Ocean Visions Summit in 2021. Below are some examples categorized by Strategic Influence/Ecosystem Efficiency, Incubation/Acceleration, and Funding/Scaling.

Strategic Influence/Ecosystem Efficiency

- Develop specific, mission-driven, bi-lateral partnerships that leverage different strengths, aggregate activities for more impact, and avoid duplication of efforts in an already fragmented ocean ecosystem. As examples, GEOS partnership with *OII* can leverage the strengths of the research networks (e.g. *Ocean Visions, Future Seas*) with the strength of an organization designed to scale funding and commercialization activities. The digital platform of *Uplink*, a partner above, can provide access to broad crowdsourced innovation information to connect with research institutions to advance the Innovation Engine goal
- Ensure the inclusion of roadmaps that link ocean research to marketplace needs of ocean and climate solutions in the GEOS Task Forces.
- Influence country-level government innovation priorities (e.g. China governmental lab, NOAA in USA, and others) in favor of ocean/climate activities
- Integrate, expand and link to activities in the Global South, to create a truly global and inclusive ocean solutions ecosystem
- Match and connect research capacity with existing sustainable ocean businesses.

Incubation/Acceleration

- Assist incubators and accelerators to bring together GEOS network members with end-users in efficient manner
- Develop consortium of mentors (industry, government, and others) and make them available to existing incubators and funders.
- Access training events and courses for starting entrepreneurs with ocean solutions.
- Initiate an Ocean Startup competitions (OS/GEOS)

Funding/Scaling

- Develop access to capital to push forward solutions and processes for solution scaling, including educational programs to educate VCs and others about ocean technologies.

GEOS Outcomes

Where we are. Many of the current efforts to generate and deploy ocean solutions are fragmented, limited in scope, and/or geographically isolated. This has resulted in a lack of system-level solutions.

For example, research and action on **resilience and adaptation of coastal communities to climate change** has typically focused on sea level and extreme events, and is rarely synergistic with other efforts looking at coastal systems in the context of **ocean carbon dioxide removal** (e.g., blue carbon), **food security, ocean-based renewable energy, and ecosystem restoration/marine conservation** (e.g., reduction of harmful algal blooms).

Where we want to be in 5-10 years. GEOS will help us to (1) coordinate efforts nationally and internationally around grand challenges in the ocean; 2) focus research capacity to address these challenges; and (3) link the research with practitioners to develop system-level solutions.

GEOS addresses the need to integrate a broad portfolio of solutions at multiple scales. GEOS will enable development of a research agenda and actionable roadmaps for *“sustainable and healthy ocean systems where humans and ocean are truly part of the same thriving ecosystem.”*

By **year 5** we anticipate (1) a thriving forum for ocean solutions that integrates research innovations into solution models, (2) greater alignment of the research community with users to scale solutions with policy/management actions and sustainable businesses, and (3) actionable roadmaps to the five grand challenges outlined in Decade Implementation Plan section 5-2.B.

By **year 10** we envision achieving significant mitigation of the effects of anthropogenic change on the human-ocean system and a thriving, equitable blue economy through implementation of these roadmaps.

5. Leadership and Implementation Process

Organizations and individuals contributing to GEOS will be committed to all stages of the research, design, and deployment of solutions and have a shared vision around achieving equitable, scalable outcomes. Since a truly non-siloed, research-centered community for developing global oceans solutions has not previously existed, starting in 2019 we have gathered a number of international research institutions and universities with a strong focus in ocean science, policy, and engineering as part of the Ocean Visions (see Appendix I; (www.oceanvisions.org) and Future Seas (<https://futureseas2030.org/>) initiatives to jump-start the GEOS.

To implement GEOS, *Ocean Visions* and *Future Seas* have joined forces with international multi-sector coordinating partners: *IOC-UNESCO*, *Future Earth Ocean Knowledge-Action Network*, the *Early Career Ocean Professionals (ECOP)* network, *The Ocean Conservancy*, the *American Geophysical Union*, *The Oceanography Society*, the *North Pacific Marine Science Organization (PICES)*, *Ocean Exchange*, *Investable Oceans*, *AiiM Partners*, the *World Economic Forum Uplink*, and the *Ocean Impact Innovation (OII)* programme led by *OceanHub Africa* and the *Blue Ocean Partners*.

Under the supervision of an international **Steering Committee**, **GEOS** is co-developing an implementation plan that is inclusive of other global partners, which will be presented and further discussed at the next Ocean Visions Summit, May 17-20, 2021. The ECOP Network will lead the theme session with mentorship from the GEOS community.

The GEOS website will be hosted on <http://www.OceanSolutions.org> and will provide the repository of all efforts carried forward under the UN Ocean Decade.

Steering Committee & Contacts for GEOS Development Team

Emanuele Di Lorenzo (**USA**)
Professor & Director
Ocean Science & Engineering, Georgia Tech
Representing Ocean Visions
edl@gatech.edu, +1 (404) 788-8035

Fiorenza Micheli (**USA**)
David and Lucile Packard Professor
Co-Director, Center for Ocean Solutions
Stanford University
Representing Ocean Visions
micheli@stanford.edu

Brad Ack (**USA**)
CEO, Ocean-Climate Trust
brad.ack@oceanclimatetrust.org

Gretta Pecl (**Australia**)
Director, Centre for Marine Socioecology, I
University of Tasmania
Representing Future Seas
gretta.pecl@utas.edu.au

Karen Evans (**Australia**)
Team Leader, CSIRO
Representing Future Seas and EPG UN Ocean Decade
Karen.Evans@csiro.au

Guddu Murtugudde (**India**)
Representing India's National Ocean Research Institutions
raghu_murtugde@iitbombay.org
gragorama@gmail.com

Makino Mitsutaku (**Japan, IGO**)
Professor, The University of Tokyo
Representing PICES
mmakino@aori.u-tokyo.ac.jp

Erin V. Satterthwaite (**USA/International**)
Early Career Ocean Professionals
satterthwaite@nceas.ucsb.edu

Alexis Grosskopf (**South Africa**)
Co-Founder, OceanHub Afirca
Representing Ocean Innovation Impact Programme
alexis@oceanhub.africa

Nadia Pinardi (**Italy**)
Professor, University of Bologna
Representing CoastsPredict Programme
nadia.pinardi@unibo.it

Martin Visbeck (**Germany**)
Head of the Research Unit 'Physical Oceanography'
at GEOMAR Helmholtz Centre for Ocean Research
Kiel, Germany
Representing The Oceanography Society
mvisbeck@geomar.de

Anna Zivian (**NGO-USA/International**)
Senior Research Fellow
Ocean Conservancy
Representing Future Earth Ocean KAN
azivian@oceanconservancy.org

Salvatore Aricò (**IGO, International**)
Head, Ocean Science Section
Intergovernmental Oceanographic Commission of UNESCO
s.arico@unesco.org

Janice Lachance (**USA/International**)
Executive Vice President, Strategic Leaders
& Global Outreach
American Geophysical Union
jlachance@agu.org

Millicent Pitts (**USA**)
Chief Executive Officer/Executive Director
The Ocean Exchange (tm)
millicent.pitts@oceanexchange.org

John Dutton (**International**)

Head of Uplink

World Economic Forum john.dutton@weforum.org

Shally Shanker

Founder & Managing Partner

AiiM Partners

shally@aimparters.com

Ted Janulis

CEO & Founder

Investable Oceans

ted@investableoceans.com

References

- Costello, C., L. Cao, S. Gelcich et al. 2019. The Future of Food from the Sea. Washington, DC: World Resources Institute. Available online at www.oceanpanel.org/future-food-sea
- Fleming, LE, Maycock, B, White, MP, Depledge, MH. Fostering human health through ocean sustainability in the 21st century. *People Nat.* 2019; 1: 276–283. <https://doi.org/10.1111/.10038>
- Gaines, S., R. Cabral, C. Free, Y. Golbuu, et al. 2019. The Expected Impacts of Climate Change on the Ocean Economy. Washington, DC: World Resources Institute. Available online at www.oceanpanel.org/expected-impacts-climate-change-ocean-economy
- Gattuso, Jean-Pierre, Magnan Alexandre K., Bopp Laurent, Cheung William W. L., Duarte Carlos M., Hinkel Jochen, Mcleod Elizabeth, Micheli Fiorenza, Oeschles Andreas, Williamson Phillip, Billé Raphaël, Chalastani Vasiliki I., Gates Ruth D., Irisson Jean-Olivier, Middelburg Jack J., Pörtner Hans-Otto, Rau Greg H., Ocean Solutions to Address Climate Change and Its Effects on Marine Ecosystems, *Frontiers in Marine Science*, 5, 2018, DOI=10.3389/fmars.2018.00337
- Hoegh-Guldberg. O., et al. 2019. The Ocean as a Solution to Climate Change: Five Opportunities for Action. Report. Washington, DC: World Resources Institute. Available online at <http://www.oceanpanel.org/climate>
- Kite-Powell HL, Fleming LE, Backer LC, et al. Linking the oceans to public health: current efforts and future directions. *Environ Health.* 2008;7 Suppl 2(Suppl 2):S6. Published 2008 Nov 7. doi: 10.1186/1476-069X-7-S2-S6
- Lubchenco, Jane and Steven D. Gaines, A new narrative for the ocean, *Science* 07 Jun 2019: Vol. 364, Issue 6444, pp. 911, DOI: 10.1126/science.aay2241
- Pendleton, Linwood , Karen Evans, Martin Visbeck, We need a global movement to transform ocean science for a better world, *Proceedings of the National Academy of Sciences* Apr 2020, 202005485; DOI: 10.1073/pnas.2005485117
- The United Nations Decade of Ocean Science for Sustainable Development (2021-2030), Brochure https://www.oceandecade.org/assets/The_Science_We_Need_For_The_Ocean_We_Want.pdf
- United Nations Decade of Ocean Science for Sustainable Development 2021 - 2030 ---- Implementation Plan, Available for download: https://www.dropbox.com/s/6q04i2b3owg3rhk/Implementation_Plan_Zero_Draft_March_2020.pdf?dl=0
- United Nations Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), 2014, <https://www.ipcc.ch/>
- United Nations Intergovernmental Panel on Climate Change (IPCC) Special Report

on Global Warming of 1.5 °C on
October 8, 2018