United Nations Decade of Ocean Science for Sustainable Development

2021 - 2030

Implementation Plan

ZERO DRAFT FOR PEER REVIEW

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Foreword

When in 2016 the United Nations completed the first World Ocean Assessment, it stated that humankind is running out of time to start managing the ocean sustainably. One question now preoccupies ocean actors everywhere: is there a way to reverse the decline in ocean health and to continue to rely on the ocean for our needs, particularly under the changing climate? The **UN Decade of Ocean Science for Sustainable Development, 2021-2030** (hereafter, the Decade) is a once-in-a-life-time opportunity to seek a positive answer to this existentially important question.

The focus of the Decade is on science because it can inform us ***what*** needs to be done and ***how***. However, in its present state of development, ocean science is largely competent for diagnosing problems. The capacity of science to offer systematic solutions to issues of sustainability needs a massive upgrade. This Implementation Plan for the Decade presents a number of directions for research and development that are necessary to make ocean science competent to support a sustainable ocean economy and managing ocean related risks. However, theoretical knowledge is not sufficient. We also need to find out ***who*** has to do what and to stimulate a move from scientific knowledge to actionable solutions. Therefore, the Implementation Plan also identifies key stakeholders and means of engaging them, leading to commitments for action and resources.

The proclamation of the Decade by the United Nations General Assembly is a clear message that 195 nations consider ocean science a priority for our civilization at the beginning of the third millennium. Decision makers and funders now need to be convinced that scientists are in position to successfully deliver, and that adequate funding for Decade research activities is a good investment of both national and international resources. They need to be persuaded that such investment will lead to science-based means of managing the ocean sustainably (for example through coastal zone management and marine spatial planning), and will underpin the development of the next generation of ocean-related hazard, climate, and extended weather services that will manage ocean-related risks and support an expanding and sustainable ocean economy.

Two processes - firstly building science capacity and mobilizing scientists, and secondly creating the enabling environment and engaging practitioners, decision makers, and the private sector - should fuse under the Decade and form an end-to-end value chain. This is the main transformation of ocean science that we need to achieve between 2021 and 2030. The scale of this metamorphosis for the oceanographic community will be unprecedented. This calls for a start to the Decade that capitalizes on existing activities and capacities, followed by the continuous acceleration and broadening of activities guided by analysis of achieved results against common targets.

The technical capacities of ocean science that we need, as a minimum, are as follows. We will need ocean observations - physical, biogeochemical, biological and ecological - for all ocean depths and for currently almost data-void polar ocean. There is a need for a breakthrough in our understanding of the composition and functioning of ocean ecosystems operating under multiple stressors. We will need to map the ocean and its ecosystems in sufficiently high resolution. Otherwise, we will not know the space in which we are acting. In our information-centred, internet-linked society, ocean data, information, and knowledge systems should be rethought and brought to a much higher level of readiness and accessibility. This will enable ocean modelling and predicting, to be brought to the same levels of maturity as leading domains of Earth system science. Vulnerability of humankind to ocean-related hazards, such as tsunamis and tropical cyclones, warrants a multi-hazard integrated warning system able to address multiple risks and guarantee effective and efficient responses.

Capacity development and transfer of marine technology will need to accompany progress at the cutting edge of research and technological development. Everyone should be able to benefit from the new ocean science paradigm, including island states, land-locked countries, and all developing countries. No one can be left behind.

The Decade is too big and too ambitious for any one group to deliver alone. Partnerships will be essential to the success of the Decade. Ocean actors will need to work outside their traditional communities and build collaborations for the co-design and co-delivery of ocean science. This will include new groupings of actors from diverse groups including business and industry, governments, UN agencies, intergovernmental organisations (IGOs), NGOs and civil society, early career ocean professionals, ocean sports and recreation organisations, and local and indigenous knowledge holders.

Science-based management of ocean space and resources will strongly contribute to grand challenges of our time, helping nations to achieve the 2030 Agenda and the Sustainable Development Goals. Ocean-based solutions exist in the areas of mitigation of and adaptation to climate change, providing food for people, supporting sustainable blue economy and human health, addressing the loss of biodiversity. Because of that, the Decade will be a catalyst for many partners in fulfilling their mandates and aspirations.

The Decade is a global undertaking but its activities will be conducted on all scales: global, regional, national and local. Undertakings of a scale such as the Decade cannot be rigidly and deterministically governed. Importantly, the Decade will offer a platform for brainstorming and co-design as well as co-delivery of ocean science. The Implementation Plan is not exhaustive nor prescriptive. It does not present specific actions but rather outlines, in broad terms, the space, direction, and opportunities for such actions. During the Decade, periodic Calls for Action will be launched to identify the actions that will be implemented to achieve the outcomes and objectives.

I hope you, the reader and a future Decade stakeholder, will adhere to and unite with the overall strategic vision and approach of the Decade as described in the Implementation Plan. With your engagement and your support, Decade outcomes will be much bigger than the sum of outcomes of the individual components and together, we will truly be able to create the science we need for the ocean we want.

Vladimir Ryabinin
Executive Secretary of the IOC

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List of Acronyms

ECOP	Early Career Ocean Professional
EPG	Executive Planning Group
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GOSR	Global Ocean Science Report
IOC	Intergovernmental Oceanographic Commission of UNESCO
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IWG	Informal Working Group
LDC	Least Developed Country
MHWS	Multi-hazard Warning System
OECD	Organisation for Economic Cooperation and Development
OL	Ocean literacy
PI	Principal Investigator
SDG	Sustainable Development Goal
SIDS	Small Island Developing State
TMT	Transfer of marine technology
UN DOALOS	United Nations Division for Ocean Affairs and the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly

Acknowledgements

As the originator and coordinator of the preparation phase for the UN Decade of Ocean Science for Sustainable Development, the Intergovernmental Oceanographic Commission (IOC) of UNESCO gratefully acknowledges the many individual and institutional contributors to the Implementation Plan. This document is the product of a highly participatory two-year process. The Plan integrates significant contributions and invaluable advice from an Executive Planning Group (EPG) comprising 20 global leaders in ocean science listed in Annex 1. Between June 2019 and May 2020, global, thematic, and regional planning meetings convened over 1000 participants from the scientific community, governments, UN agencies, NGOs, private sector and donors across nine ocean basins. These meetings provided important input to the Implementation Plan on scientific priorities and capacity development needs, as well as information on existing and future partnerships to implement Decade Actions. Annex 2 contains a summary of key outcomes of these meetings. UN agencies provided substantial input throughout the development process via the UN Oceans Contact Group for the Decade. In addition, over 50 leading ocean institutions listed in Annex 3 provided written submissions to the development of the scientific objectives and orientations of the Decade.

Structure of the Implementation Plan

The Implementation Plan has three parts:

Part 1 *explains the rationale for the Decade and the desired state of the ocean at the end of the Decade.*

Part 2 *describes a framework to guide the design and implementation of Actions throughout the Decade. It presents the scientific objectives of the Decade and a set of strategic orientations to organise Decade Actions. It presents different types of Decade Actions, and the criteria and process for the endorsement of Decade Actions. It describes principles to guide data management, capacity development, and engagement with different stakeholders throughout the Decade.*

Part 3 *describes the proposed governance and coordination arrangements of the Decade, the mechanisms for resource mobilisation and the process to measure progress.*

The Implementation Plan is not a prescriptive document. It is a strategic framework within which initiatives can grow and flourish while still ensuring they contribute to the overall Decade vision and mission. Regular reviews of the Implementation Plan throughout the course of the Decade will ensure its ongoing relevance.

Part 1: UN Decade of Ocean Science for Sustainable Development

Part 1 of the Implementation Plan explains the rationale for the Decade, discusses the building blocks required to move from the 'ocean we have' to the 'ocean we want', and describes the desired state of the ocean at the end of the Decade.

1.1 Rationale for the Decade

Humankind increasingly relies on the vital life supporting services provided by the ocean. The High-Level Panel on Sustainable Ocean Economy[1] considers the ocean a source of solutions for climate change mitigation and for many dimensions of a sustainable blue economy and human wellbeing, including the future of food, marine genetic resources, energy, minerals, and human health. According to conservative estimates by the OECD, the ocean economy generated $US1.5 trillion in 2010 and has the potential to outperform the growth rate of the global economy both in terms of generated value and employment[2]. It could potentially reach an output of US$3 trillion in 2030, and achieve this by developing along a more sustainable pathway. However, the continued growth of the ocean economy, and the ocean's ability to continue to provide essential services to humanity, critically depends on the health of the ocean, including the effects of climate change.

A vast body of evidence demonstrates the large scale, negative and increasing impacts of human activities on the ocean and its health. Over 40% of the ocean's surface is strongly affected by multiple drivers, and 66% is experiencing increasing cumulative impacts[3]. Global ocean warming has continued unabated since 1970s, with a doubling of the rate of warming since the early 1990s and a rise in the frequency of marine heatwaves[4]. Exacerbated by ocean acidification and other factors, this warming will lead to large-scale disappearance of corals; a cornerstone of the world's biodiversity, and a source of food and livelihoods for hundreds of millions of people. The list of negative impacts on the ocean is long and thoroughly documented in ocean science literature. Today, our most pressing goal is to move from diagnosis of a problem, towards finding a solution to the current challenges that face the ocean and thus humankind.

The ocean is one of the last frontiers for exploration on the planet. Vast swathes of the ocean exist where very little is known. Observations and knowledge of deep waters and the seabed in areas beyond national jurisdiction, including the interaction between the physical structures and the biota in those areas, are extremely limited. In our quest for solutions to the challenges facing the ocean, we will need to identify gaps

[1] https://www.oceanpanel.org/

[2] OECD (2016). *The Ocean Economy in 2030.* OECD Publishing, Paris.

[3] IPBES (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages.

[4] IPCC, 2019: Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. In press.

in our scientific knowledge and generate the required missing knowledge through targeted research. To translate the knowledge into appropriate decisions and actions, we will need to build a wide range of specific applications, services and decision support systems, ensure equitable access to the knowledge, develop corresponding capacities in all countries, and strengthen ocean literacy among many types of stakeholders, including the general public.

Finding efficient and systematic solutions to the complex interactions and effects of multi-stressors on the ocean requires better equipped and more sustainably funded science. The 2017 Global Ocean Science Report[5] concludes that, while there is progress in observations, data and information flows in ocean science, national investment in ocean science around the world remains low. On average, only 1% of national research budgets were attributed to ocean science between 2013 and 2017. Funding of ocean observations and research is not stable and cannot be guaranteed, even in the short term. As a result, ocean observing networks remain less sustainable than, for example, meteorological networks. The fundamental role of ocean science in achieving sustainability is broadly recognized but is not yet solidly reflected in the policies and the budget allocations of nations. The ocean science-policy interface is only starting to take shape, and is gradually becoming robust enough to facilitate uptake of ocean science leading to evidence-based decision making and policies.

The only possibility to move from the 'ocean we have' to the 'ocean we want' is to convince key stakeholders that the world requires a transformational, large-scale, innovative campaign of ocean science and partnerships to improve delivery (refer Figure 1.1). This campaign needs to be of sufficiently long duration to mobilize the ocean science community to deliver the ocean science needed to influence decision-making and policy thus leading to increased sustainability. In 2016, the Intergovernmental Oceanographic Commission of UNESCO (IOC) initiated a concept for such a campaign and consulted IOC Member States and numerous other interested parties in its development. On 5th December 2017, this preparatory work culminated in the declaration by the 72nd Session of UN General Assembly (UNGA) of the **UN Decade of Ocean Science for Sustainable Development 2021-2030** (referred to hereafter as 'the Decade'). The UNGA called on the IOC to prepare an Implementation Plan for the Decade in consultation with Member States, specialized agencies, funds, programmes and bodies of the United Nations, as well as other intergovernmental organizations, non-governmental organizations and relevant stakeholders. This Implementation Plan for the Decade - which is the result of a highly inclusive two year preparation process involving thousands of stakeholders - will guide us in the ambitious endeavour represented by the Decade, and will evolve with time reflecting new possibilities, opportunities and challenges.

Box 1.1: Ocean Science in the Context of the Decade

In the context of the Decade, 'ocean science' is interpreted broadly as encompassing: social sciences and human dimensions; the infrastructure that supports ocean science (observations, data systems etc.); the application of those sciences for societal benefit, including knowledge transfer and applications in regions that are lacking science capacity; and the science-policy/user interface. Ocean science integrates local and indigenous knowledge.

The Decade represents a possibility to build scientific capacity and durably use the potential of the ocean to achieve the goals of the 2030 Agenda for Sustainable Development. There are numerous interactions between Sustainable Development Goal (SDG) 14 related to the conservation and sustainable use of the

[5] IOC-UNESCO. 2017. Global Ocean Science Report - The current status of ocean science around the world. L. Valdés et al. (eds), Paris, UNESCO Publishing.

ocean, seas and marine resources, and the achievement of many other SDGs[6]. For example, under optimistic projections the ocean has the potential to supply up to six times more food that it does today[7] (SDG2 - zero hunger). New technologies in renewable energy or carbon stockage could increase the capacity of the ocean to mitigate the worst effects of climate change (SDG7 - affordable and clean energy; SDG13 - climate action). New knowledge and tools for coastal nature based solutions could increase the adaptive capacity of hundreds of millions of the most vulnerable people (SDG3 - good health and wellbeing; SDG10 - reduced inequalities).

The Decade will also contribute to achieving global aspirations contained in the UN Framework Convention on Climate Change, the Convention on Biological Diversity, the Sendai Framework for Disaster Risk Reduction and the Small Island States Accelerated Modalities of Action (SAMOA) Pathway, and emerging agreements including a new agreement on the conservation and sustainable use of biodiversity in areas beyond national jurisdiction. UN agencies, including members of UN-Oceans - the UN wide inter-agency coordination mechanism focusing on ocean issues, will be key contributors to and, importantly, beneficiaries of the Decade. The Decade will strongly contribute to complementary UN initiatives including the UN Decade of Ecosystem Restoration and the Decade of Action to deliver the SDGs.

The scope of the work envisaged during the Decade is beyond the capacity of any single nation and the ocean, once again, is offering us an opportunity to work together for the common good in the true spirit of multilateralism. Central to the success of the Decade will be co-design, engagement, and partnership. This Decade will be for all: for scientists, intergovernmental and non-governmental organizations, for states, nations and individuals, for research institutes, practitioners and the private sector, indigenous people and holders of traditional knowledge, for educators and students, for recreational and sporting users of the ocean, for artists, and many others. In short, the Decade is everyone's Decade and active engagement by all actors will be essential to its success.

[6] International Council for Science (ICSU), 2017. A Guide to SDG Interactions: from Science to Implementation [D.J. Griggs, M. Nilsson, A. Stevance, D. McCollum (eds)]. International Council for Science, Paris

[7] 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

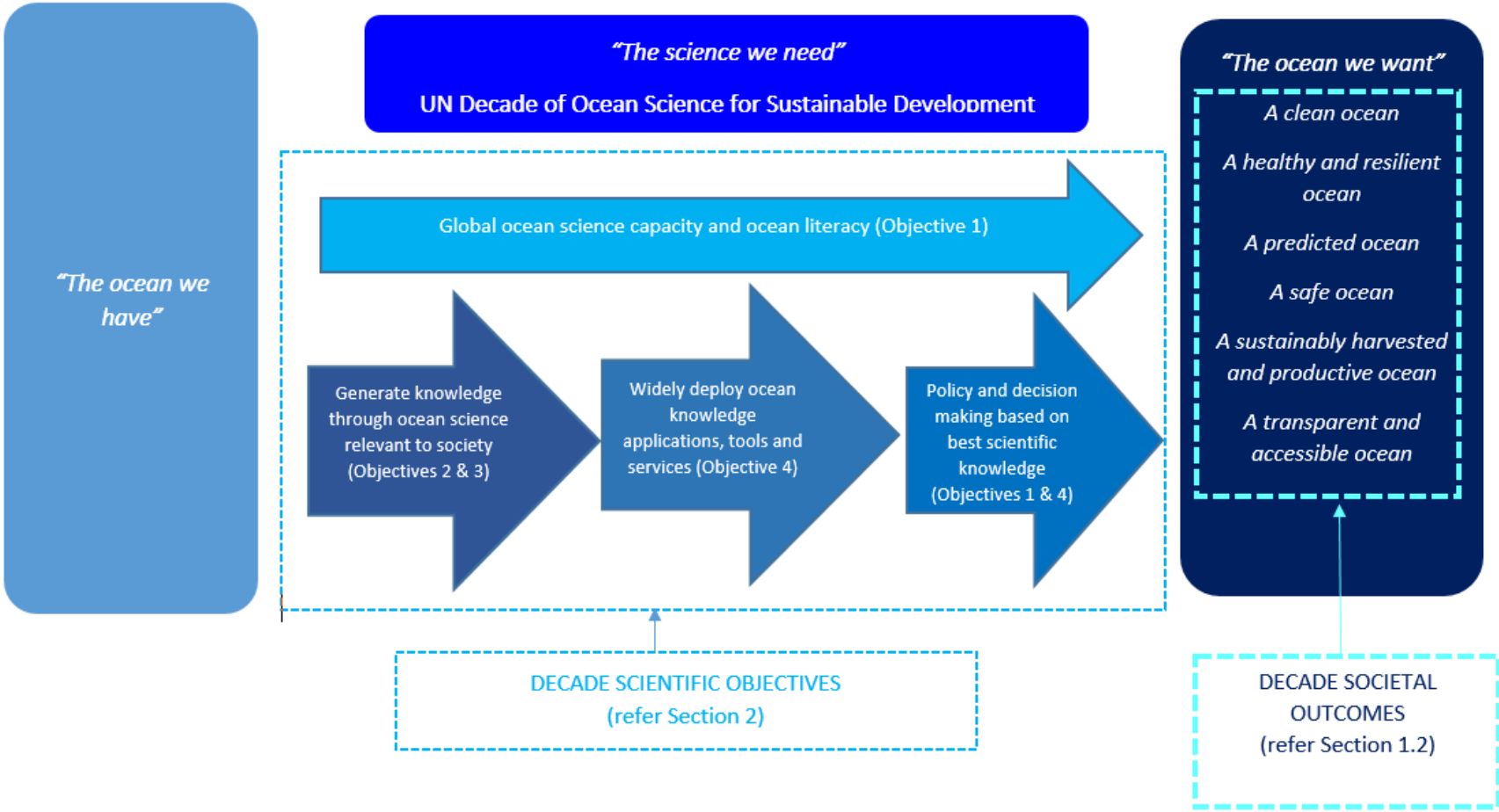

Figure 1.1: Transforming from the 'Ocean we have' to the 'Ocean we want'

1.2 Vision, Mission and Outcomes of the Decade

The vision of the UN Decade of Ocean Science for Sustainable Development is as follows:

The science we need for the ocean we want.

The mission of the Decade is:

To generate and use knowledge for the transformational action needed to achieve a healthy, safe, and resilient ocean for sustainable development by 2030 and beyond.

The Decade aims to support all ocean actors to implement the ocean science needed to move from the 'ocean we have' to the 'ocean we want'. The following six outcomes describe the ocean we want at the end of the Decade:

A clean ocean where sources of pollution are identified and removed. Society generates pollution of many forms that is unsustainable for our ocean. It is critical to find solutions that support healthy ecosystems and human wellbeing for those who rely on and use our ocean. Science can reveal the causes and sources of pollution and help us to develop paths to eliminate or redirect harmful activities.

A healthy and resilient ocean where marine ecosystems are mapped and protected. Degradation of marine ecosystems is accelerating due to unsustainable growth in the use of the ocean. We need solutions for enhancing effective management of ecosystems, including building resilience, facilitating restoration and identifying adaptation strategies that will ensure ecosystem functioning and continuing delivery of marine ecosystem services to society. Science can provide understanding of the complete marine ecosystem and inform societal choices for protection of the ocean, allowing the natural and economic benefits of the ocean to be sustained.

A predicted ocean where society has the capacity to understand present and future ocean conditions. The vast volume of the ocean is neither adequately observed nor fully understood. We need to more fully explore and understand the changing ocean, from its depth to its surface to its coastlines. More complete scientific analysis of the ocean, including physical, chemical and biological research, will enable more reliable explanations of its present condition and changes that we are seeing. It will also allow confident predictions of the future state of the ocean, from time scales that support business decisions and reduction of risk, to futures that inform policy decisions.

A safe ocean where people are protected from ocean-related hazards. The increasing frequency and intensity of ocean hazards such as storm surges, tsunamis, associated coastal erosion and harmful algal blooms are already affecting coastal communities and economies. Mechanisms and processes for minimising and mitigating these hazards are required to help diminish future negative impacts. Physical and social science can point us toward enhanced courses of action for coastal residents and communities to increase readiness and resilience.

A productive and sustainably harvested ocean ensuring the provision of food supply and stable livelihoods. The world population now depends on the ocean for food more than ever before and this demand will rise rapidly in line with population growth. Fisheries will only be able to fulfil a part of this demand and science will inform decisions regarding sustainable aquaculture that will be essential to meet future demand. In addition to being a vital source of nourishment, the ocean directly supports the livelihoods of

about 500 million people especially in the poorest nations. Ocean economies are among the most rapidly growing and promising in the world, providing benefits to many sectors including biotechnologies, energy production, tourism and transport. Science underpins the development of these sectors as they evolve and facilitates their sustainability.

A transparent and accessible ocean with open access to data, information and technologies. Presently there are inequalities in ocean science capacity and capabilities among nations. At the same time, there is a need for more widely disseminated ocean information at the scientific, governmental, private sector, and public levels for decision-making. Improving access to and better understanding of science-based ocean measurements will enable all decision makers to direct proper choices for societal prosperity and environmental security.

As illustrated in Figure 1.1, achieving this shift requires a multi-step, iterative process. The Decade will achieve the desired outcomes by addressing deep disciplinary **understanding of ocean processes and conducting co-designed solution-oriented research** that spans all aspects of the ocean including human interactions. It will optimise the use of existing knowledge, and generate new knowledge. This knowledge will underpin the development and deployment of relevant and accessible **decision support systems, services and tools** that will lead to knowledge-based societal applications. This will in turn be used at the science-policy interface for **improved evidence based decision-making and policy development** by national, regional and international actors. **Capacity and capability development** will be an essential element of each stage of this process targeting a range of stakeholders from the scientists delivering the research, to the end-users of the knowledge.

Box 1.2: Transformative Ocean Science

Central to the Decade is the notion of transformation. The Decade, both in terms of Actions and outcomes, needs to move beyond business as usual to a true revolution in ocean science. The different ways in which the transformative nature of the Decade will manifest include the promotion and facilitation of:

- Ocean science that uses the 2030 Agenda as a central framework to identify and address the most pressing societal questions related to SDG14 and related SDGs
- Ocean science that is developed to be relevant and responsive across the entire value chain from knowledge generation, to applications and services, to end-users
- Big, audacious ocean science that spans geographies and continues over long periods of time
- Ocean science that is co-designed in a multi-stakeholder environment
- Ocean science that reaches across disciplines and actively seeks collaboration with social and human sciences
- Ocean science that integrates local and indigenous knowledge as a key knowledge source.
- Ocean science that is transformative because of who is doing it or where it is being done and that strives for generational, gender and geographic diversity in all its manifestations
- Ocean science that is communicated in a form that is understood and used by end-users

The Decade will harness **rapid development of novel and existing technologies** to dramatically increase both the diversity and scope of ocean exploration and sustained observations, and to achieve greater predictive capability to guide sustainable pathways. To **enhance predictive capability**, the Decade will maximise the use of current and historical observations of the ocean, including developing rigorous approaches that merge indigenous and local knowledge and understanding with scientific observations and understanding, with developments in forecasting systems, assessments and indicators. It will deliver ocean knowledge to diverse end-users

through **new data and information platforms** that are fit for purpose. Such platforms will allow for adaptation strategies and science-informed policy responses to global change and predictions thus avoiding ecological tipping points, and ensuring that disasters are predicted, well prepared for and mitigated.

Part 2: Decade Action Framework

Part 2 of the Implementation Plan describes a framework to guide the design and implementation of Actions throughout the Decade. It presents the scientific objectives of the Decade and a set of strategic orientations to organize Decade Actions. It presents the various types of Decade Actions, and the criteria and process for the endorsement of Decade Actions. It describes principles to guide data management, capacity development and discusses how stakeholders can engage in the Decade.

2.1 Scientific Objectives and Orientations

This section presents the scientific objectives and orientations for the Decade, and provides a framework within which Decade Actions can be developed and delivered.

The Decade's scientific objectives respond to the steps in the process illustrated in Figure 1.1 and aim to:

- Increase understanding of present and future ocean states and expand global observations (***Objective 2 – Expand innovate and integrate ocean knowledge systems globally***).
- Use this increased understanding to assess and predict the interactions between all components of the ocean, including human interactions (***Objective 3 – Understand and predict the whole ocean system and its component parts***).
- Develop and deploy tools, services and applications required to use knowledge for improved decision-making *(**Objective 4–Develop integrated assessment and decision support systems***).

Underpinning the achievement of all the objectives will be increased ocean science capability and capacity, and increased common understanding of the ocean by society (***Objective 1 – Increase transformative ocean knowledge capacity and capability globally***). The structure of the four objectives follows a circular value chain approach - with each objective adding value to each of the other objectives, and with the needs for decision making and evaluation (Objectives 4) driving the focus for improved understanding (Objectives 2 and 3).

The strategic orientations under each objective provide a structure for organising and clustering Decade Actions to meet the objectives.

The following sections include examples of the outputs and benefits, in the form of societal applications and priority research and development products that Decade Actions could generate for each objective. This discussion is not exhaustive but demonstrates possible outputs of the Decade, and aims to inspire reflection on the development of Decade Actions.

Objective 1: Increase transformative ocean knowledge capacity and capability globally

This objective will contribute to Decade outcomes by expanding present scientific and technical capacity for exploring, observing, assessing and delivering solutions for decision-making. It will engage a broader cross-section of society in understanding the importance of the ocean for sustainable development and using that knowledge for decision-making. Fulfilment of this objective will build cooperation at sectoral, national, regional and/or international scales, and thus facilitate the interdisciplinary, transdisciplinary and/or cross-sectoral partnerships required for undertaking science. Such cooperation will require open access to all available information in order to generate solutions to the complex problems people and the ocean are facing. This cooperation will also facilitate the transfer of knowledge and technical understanding required to close current gaps in science capacity and sustainable policy development. It will contribute to building an ocean-educated society that understands the problems the ocean is facing and the solutions needed, ensuring the global engagement required to meet the 2030 Agenda.

Strategic Orientations

1.1: Develop systems that facilitate open sharing of marine scientific research outputs, marine and digital technologies and ocean knowledge, including information systems that support the Findable, Accessible, Interoperable and Re-usable (FAIR) principles and best practices.

1.2: Build and share scientific and technical capabilities to provide equitable access to ocean knowledge through an open access data portal for all ocean data systems.

1.3: Develop mechanisms to expand training, education and ocean literacy.

1.4: Develop easily and readily deployable evaluation systems to track global progress in expanding scientific and technical capability and ocean literacy.

Resulting outputs and benefits:

The envisaged outputs of this objective include a global data, information and knowledge platform for sharing ocean knowledge across diverse ocean actors from generators or knowledge, to end-users. It could include multi-sectoral best practices in ocean research, observation and knowledge management. The platform could provide access to sustained ocean observing and forecasting tools to an increasingly diverse number of participating countries and institutions. It could act as an ocean data and information distributed system based on FAIR principles and on open source software technology that enables custom development of user-demanded products and services. The platform could provide access to training, education and ocean literacy content and best practices related to research, observations, and data. It could also provide a clearinghouse / match-making service to match capacity development needs with providers of services. The resulting benefit would be broader access to, and increased use of ocean observations, data and information; and innovation in the development and sharing of ocean data services. Such an output would potentially have direct relevance to international processes including negotiations for the conservation and sustainable use of biodiversity beyond national jurisdiction, which envisages the development of a clearinghouse mechanism to share data and access to capacity development and transfer of marine technology.

Actions under this objective are also expected to generate a wealth of new training, education and capacity development initiatives in line with the strategic capacity development framework described in Section 2.4. Many of these initiatives which would target Early Career Ocean Professionals and beneficiaries from SIDS and LDCs. Outputs could include scientific training, education and professional development programmes on priority or emerging scientific issues related to multi-stressors, ocean-climate nexus, climate resilience and adaptation, ocean sustainability science, underwater cultural heritage, or emerging marine pollutants. Such initiatives will apply to the whole value chain of ocean science from observations and data, through to the development and use of applications, services and decision support systems. The objective would be achieved by activities on the ground, including promoting the transfer of marine technology through the design of multinational scientific expeditions. An important outcome would be built or enhanced national infrastructural and human capacity in the area of ocean science.

End-users of ocean knowledge including governments and policy makers are expected to be important beneficiaries with targeted capacity development efforts related to interpreting and using ocean knowledge for policy and decision-making. This could include capacity and support for development of national ocean capacity development policies and plans. It could also build capacity in the use of tools and systems developed under Objective 4, as well as in key thematic areas including methodologies to develop scientifically robust ocean related nationally determined contributions to the UNFCCC; marine spatial planning and integration of ocean science in blue economy policies and plans; area based management tools including marine protected area governance; environmental impact assessment; and coastal zone management and adaptation. Actions would seek to strengthen knowledge and exchange around ocean-related services and products, boosting local uptake of ocean information by the private and public sectors.

Given the importance of co-design and co-delivery to achieve transformative science, Decade Actions under this objective could further target multi-stakeholder capacity development efforts in co-design and co-delivery of ocean science. Further implementation of Ocean Literacy initiatives at the global level would increase the awareness of the ocean's function and provide a common understanding of its importance.

Finally, outputs of this objective could build on the processes developed for the Global Ocean Science Report to deploy new tools for tracking evolution of ocean science capacity and ocean literacy amongst different groups and in different geographies so that gaps and emerging priorities could be rapidly identified and addressed throughout the Decade.

Objective 2: Expand, innovate and integrate ocean knowledge systems globally

This objective will contribute to Decade outcomes through the expansion and further development of existing systems to allow the generation and delivery of interdisciplinary knowledge required for decision-making. Actions carried out under this objective will expand and sustain the collection of ocean knowledge by developing new technologies and infrastructure to observe, explore, and use ocean information, and to build and enhance global ocean partnerships to create impact. Actions will provide end-users and the global ocean exploration, sustained observing, and modelling communities with access to ocean knowledge in near-real time, spanning many disciplines, and extended to understand human impacts on the ocean. This is essential for enhancing and validating “whole system” models, assessments and the resource and conservation management frameworks required for a sustainable ocean future.

Strategic Orientations

2.1: Advance global ocean observing systems in all ocean basins to deliver information on all aspects of the ocean (including understanding of societal interactions and in traditionally under-explored regions of the oceans).

2.2: Innovate and improve services using ocean knowledge; improve partnerships between information generators and end-users.

2.3: Develop and implement new technologies to lower the costs of extending and accelerating ocean knowledge discovery.

2.4: Develop mechanisms to integrate traditional, experiential and local knowledge into ocean observation, monitoring and assessment systems.

Resulting outputs and benefits:

Ocean observations are the key to understanding weather, climate, and the future state of marine ecosystems and resources. Today's Global Ocean Observing System provides the backbone for ocean and weather forecasts, and delivers understanding of the ocean's role in the global climate system, as well as the climate's impact on the ocean. As part of this objective, enhancement of existing observing systems would be envisaged resulting in a fully integrated global ocean observing system that captures essential physical, chemical, biological, and ecological ocean properties, from global to local coastal scales. Such a system would also integrate information on human pressures, and support more countries in developing observing capacity.

Actions under this objective could generate partnerships from sustained observations and innovative experimental work to knowledge systems that yield more responsive, delivery-focused, and therefore sustainable observing systems. Increased fit-for-purpose ocean information products (including forecasts, indicators, and coastal warnings) could be generated. Improvement of ocean observing systems including improved evaluations of the adequacy and gaps in observing and information systems, faster and more widespread adoption of new and innovative technology in observations, data, and forecast systems, and focused technological development to allow a greater number of countries to actively make sustained ocean observations and operate forecasting systems would all be important outputs of this objective, improving geographic equity.

Mechanisms and tools to capture and integrate indigenous and local knowledge into global ocean observing and forecasting systems will also be important outputs of this objective.

As part of this objective, the Decade would create conditions for involvement of downstream beneficiaries of ocean observations. Their input would provide a very useful feedback on the quality and quantity of the observation information provided and their interest in obtaining the data should create a "pull" and resource base for expanding and sustaining the ocean observations.

Objective 3: Understand and predict the whole ocean system and its component parts

This objective contributes to the Decade outcomes through improved predictive capability. Improved understanding of the present and future states of the ocean system, including how humans interact with and affect the ocean are essential for adaptive and restorative responses to change. Actions carried out under this objective will expand understanding and knowledge of ocean processes and ecosystems as well as areas of the ocean that are currently poorly observed and poorly understood, for example, the role of the ocean in the earth and climate systems or the impacts of human activities on the ocean system. Such understanding is essential to make decisions about the ocean given the multiple human impacts that it is subject to, and the speed at which it is changing. This objective will also improve detection and forecasting for hazards and harmful events (e.g. tsunamis, harmful algal blooms, seasonal acidification events and marine heatwaves). This would in turn lead to the development of services under Objective 4 that would to generate faster, more effective, nimble and adaptive responses to these threats, as well as supporting economies and jobs in the marine sector with operational services.

Strategic Orientations

3.1: Map all components of the world ocean (for example, physical, geological, biogeochemical, biological and socio-ecological) including human activities across time scales.

3.2: Identify the role and functioning of ocean components from the surface to the deep, including the systems that are essential to ocean health and human wellbeing.

3.3: Improve forecasts and predictive capability for destabilising hazards or events (for example: regime shifts, trophic cascades, tsunamis, storm surges) to deliver an integrated global warning system.

Resulting outputs and benefits:

This objective is expected to build on current efforts to map the world ocean and produce a digital global ocean atlas including parameters of the physical, biological, chemical, and geological environments, as well as ecosystems, underwater cultural heritage, boundaries, and resources. Today, the science capability of analysis and predictability is greater than the resolution of ocean maps. An atlas of ocean information would address the prevailing and future multiple societal drivers and pressures on the ocean. Designing such a digital georeferenced atlas of the ocean would be an innovative undertaking that requires consolidation of existing knowledge, review of requirements, potentially new research and development, and comprehensive assemblage. The shipping and transport community, weather and ocean forecasters, fishing industries, marine resource managers, coastal cities and communities vulnerable to sea-level rise, tsunami, and tropical cyclones, are all dependent upon accurate ocean maps of one or more parameters

A multiple ocean stressor inventory could be developed under this objective. This inventory would be aligned globally, but would incorporate details on the local and regional importance of individual drivers. Such an inventory would support the implementation of science-based ecosystem based management strategies addressing multiple ocean stressors. It would contribute to identifying global, regional and local sources of changing ocean health and the interaction of different stressors and their final responses, thus aiding society to sustain the ocean services indispensable for human health.

A further central output of this objective is expected to be improved modelling and prediction capabilities to deliver relevant and timely societal services. Improved models and related prediction capacities will also impact positively on weather services in support of marine transportation, tourism, energy operations, cabling and communication, fisheries, and recreation. Improved predictions of the whole ocean system would be achieved by integrating biological observations in existing models; improving inter-model comparison; and developing multi-stakeholder participatory scenarios in relation to ocean variability and change and ocean productivity as well as impacts on agricultural practices and yields.

Objective 4: Develop integrated assessment and decision support systems and other transformational tools and processes

This objective contributes to the Decade outcomes through assessments, services and decision support tools that will allow advanced approaches to assessing and mitigating risk, creating economic opportunity, and implementing effective and sustainable management strategies for human use of the ocean. Actions carried out under this objective will foster the development of "knowledge to end-user" pathways. New and innovative applications, services, decision-support tools and scenario-based systems will facilitate the use of ocean knowledge for informed decision making and adaptive management at local to global scales. This objective will enhance the opportunities for accessing sustainable economic benefits from marine resources across the global ocean. It will advance the development of sustainable coastal development and uses of the ocean - including inputs to the development of a sustainable blue economy that will ensure ongoing, future functioning of the ocean and benefits for human wellbeing.

Strategic Orientations

4.1: Develop cultural, economic, social and ecosystem indicators of ocean health that identify thresholds and tipping points.

4.2: Develop and disseminate analytical tools to predict human and environmental interactions based on multiple stressors.

4.3: Develop innovative platforms for place-based planning processes that support equitable access, protect ecosystem functions and services and provide for sustainable development, that are readily deployable across regions and scales.

4.4: Develop services for building adaptive responses to destabilising hazards or events, including restoration and recovery of ecosystems, recognising trade-offs and increasing the resilience of coastal communities.

4.5: Facilitate greater scientific engagement in policy processes through improved science-policy mechanisms at multiple scales.

Resulting outputs and benefits:

New services and information to support ecosystem-based management, ocean related hazard mitigation, as well as the management of the expansion of sector-based activities (e.g. fisheries, aquaculture, tourism, and shipping) are expected to be delivered under this objective. Area-based integrated assessments defining the ocean carrying capacity and sustainability thresholds could be implemented, hence informing regional and local decision-making regarding key questions including the future of food production from the

sea, climate change adaptation, amongst others. These outputs would strengthen the effectiveness of management applications such as marine spatial planning, coastal zone management, fisheries rights-based management, and area based management, including marine protected areas.

Processes and dialogues to help build the capacity of decision-makers to understand and use ocean knowledge and to push for institutional change in order to allow for more evidence-based policy making would be important outputs of this objective. These partnerships would most effectively be developed through early engagement in those regions where gaps exist. Inclusive cooperation models and mechanisms, involving policy-makers and end-users, to formulate research questions, conduct collaborative research, collect and disseminate data, and build technical capacity among stakeholders could be delivered. Such mechanisms would be closely linked to capacity development actions under Objective 1.

Well-defined, transparent, and inclusive processes to facilitate communication at the science-policy interface would be established under this objective to ensure trusted sources of data and information, including indigenous, are producing credible, relevant, and legitimate knowledge, at all scales, for all ocean sectors.

Innovation clusters bringing public sector and ocean businesses are expected flourish in areas of market demand that support cross-sectoral collaboration and link emerging technology research and innovation with established industry players, hence augmenting the delivery of solutions.

New technologies are envisaged to leverage vital innovations in integrated ocean management. For example, real-time information and automation would allow robust and nimble adaptation and immediate responses to changing ocean conditions and environmental threats and create new accountabilities in government and in business. Mechanisms to share these new capabilities could be made available to all ocean stakeholders.

As an example, there are a number of unconnected warning systems for ocean-related hazards. Some of them are operational, e.g. for tsunami, some are incomplete, e.g. for storm surges, and some emerging, e.g. harmful algal blooms. Widely recognized and reflected in the Sendai Framework for Disaster Risk Reduction is the need to strengthen and harmonize the warning system. Experience shows a strong advantage of developing multi-hazard warning systems (MHWS) able to act on more than one type of risk. As part of this objective, it is expected that efforts will focus on incorporating ocean components into emerging or existing MHWSs. The improved systems would more effectively use ocean information for warnings of ocean-related hazards at a variety of time scales, from immediate threats, such as tropical storms, to long-term high-impact events like droughts, heat waves, forest fires, or floods. Most importantly, the system would be developed to strengthen and upscale the preparedness of communities at risk.

2.2 Decade Action Hierarchy and Endorsement Process

This section presents the different types of Decade Actions and discusses the criteria and process for endorsement of Actions as part of the Decade.

Decade Actions are the tangible initiatives and endeavours that will be resourced and carried out across the globe over the next ten years to achieve the Decade objectives and thus reach the Decade outcomes. Decade Actions will be carried out by a wide range of actors including research institutes, UN agencies, the private sector, NGOs, educators, community groups or individuals (e.g. via citizen science initiatives).

Different levels of Decade Actions will be implemented. They will be organised around the strategic orientations described in the previous section. Decade Actions include **programmes** and their related **projects, activities**, and/or **contributions.**

A **Decade programme** is global or regional in scale, will fulfil one or more of the Decade objectives. It is long-term (multi-year), interdisciplinary and typically multi-national. A programme will consist of component projects, and potentially enabling activities.

A **Decade project** is a discrete and focused undertaking that is typically of a shorter duration. It may stand alone, but will typically contribute to an identified Decade programme.

A **Decade activity** supports a Decade outcome, objective, programme, or project. It is typically a one-off standalone activity (such as an awareness-raising event, a scientific workshop, or a training opportunity). It can form part of a programme or project or can relate directly to a Decade objective.

A **Decade contribution** supports the Decade through provision of a necessary resource (e.g. funding, resource mobilisation, data, or an in-kind contribution). A contribution can be either for costs related to the implementation of a Decade Action or for coordination costs.

Decade Actions will be resourced by a diversity of partners including national governments, philanthropic and corporate foundations, multilateral and bilateral funding agencies, and individuals (e.g. via crowdfunding). Section 3.2 provides further discussion on financing and resource mobilisation for the Decade.

Actions endorsed under the UN Decade of Ocean Science for Sustainable Development will:

1. Contribute to achieving the Decade objectives and the associated strategic orientations.
2. Accelerate the generation of knowledge and understanding of the ocean.
3. Enable the uptake of science and ocean knowledge at societal and policy levels, with a specific focus on knowledge that will contribute to the achievement of the SDGs.
4. Ensure that all data and resulting knowledge are provided in an open access, shared, discoverable manner and are appropriately deposited in recognized data repositories consistent with the IOC Oceanographic Data Exchange Policy[8] or the relevant UN subordinate body data policy.

Submissions for endorsement shall also indicate how the proposed Action will address:

5. Partnerships across nations and/or between diverse ocean actors.
6. Contributions toward capability and capacity development, including but not limited to beneficiaries in Small Island Developing States (SIDS) and Least Developed Countries (LDCs).
7. Gender, generational, and geographic diversity
8. Integration of local and indigenous sources of knowledge.

All Actions will need to demonstrate support from the relevant national government(s).

Requests for endorsement of Decade programmes will be reviewed and decided by the Board of the UN Decade of Ocean Science for Sustainable Development. The Decade coordination structures will decide

[8] Refer https://www.iode.org/index.php?option=com_content&view=article&id=51:ioc-oceanographic-data-exchange-policy&catid=24&Itemid=100040

requests for endorsement of Decade projects, activities and contributions[9]. All submissions will be reviewed against the endorsement criteria identified above. Once endorsed, Actions will be reported on the Decade website. As an endorsed Action of the Decade, proponents will be able to use the Decade logo during the implementation of the Action. Proponents will be required to provide a brief annual report on the implementation of the Action.

2.3 Data, Information & Knowledge Management

This section describes the data, information and knowledge management framework that will be collectively developed throughout the Decade.

Stakeholder discussions throughout the preparation phase of the Decade agreed that data, information and knowledge sharing and management are a cornerstone for the success of the Decade. The vision for data, information, and knowledge management during the Decade is that the ocean community will collectively co-design and construct a shared multidisciplinary digital representation of the ocean's socio-environmental system, viewable from multiple perspectives and through multiple interfaces tailored to stakeholder needs and capacities, i.e. 'a digital twin of the ocean'.

To achieve this, the Decade will require an openly accessible, usable, and responsive digital management framework. This includes digital resources to support a holistic understanding of marine social-ecological systems and includes historical data, contemporary data (including real-time data streams), and modelled data to help predict future ocean conditions. The design and development of the system must overcome existing barriers - including data fragmentation, siloing of data, lack of data sharing, and hidden or underexploited datasets.

The data, information and knowledge system will link knowledge generators to end-users. To this end, it must support scientists, planners, decision-makers at all levels, as well as businesses, citizens, and other stakeholders in accessing and using information products and services tailored to their needs. Rather than accessing and utilising raw data, many end-users will interact with dashboards, decision support tools, and other interfaces built upon trusted and scientifically sound data. This requires that software developers have access to easily reusable and harmonised data sources and that the provenance of the data is easily and accurately traceable.

This ambitious goal will require input from a distributed - but closely coordinated - community of contributors and end-users. Much of the required capability to build a coordinated digital ecosystem for the ocean is available: many actors - from national institutes to small enterprises and research initiatives - have created immense capacity to gather, manage, integrate, analyse, communicate, and act on complex marine data. However, efforts to rally, focus, align, and combine efforts across all sectors - i.e. academic, philanthropic, industrial, and governmental, must be increased and this is the main challenge for data management work under the Decade. Building the Decade's digital framework will be a continuous process, responding to innovation and unforeseen needs while maintaining operational integrity. It will leverage and help coordinate existing systems and capacities in such a way that they can act as interoperable components of a global

[9] The Decade Board and Decade coordination structures are described in more detail in Section 3.1.

whole. Implementation will build on existing and well-functioning systems and networks of trust, while simultaneously providing an impetus to fill known gaps and detect new ones.

The Decade's data, information, and knowledge framework will allow compatible systems to:

- Interlink resources that are grounded in peer-reviewed, trustworthy science or transparent, quality-controlled procedures and which deliver content traceable to raw observations, measurements, analyses, or models of the earth system, across its socio-environmental dimensions.
- Provide and enable examination of predicted future states of societal systems and their host ecosystems, as well as the impacts they have upon one another.
- Be responsive to end-users needs through proactive engagement and co-development.
- Be extensible, allowing development of new components to address unforeseen needs that are capable to rapidly interoperate with other components.
- Accelerate the pace of scientific discovery and its rapid application across the ocean value chain.
- Be capable of incorporating and rendering accessible datasets related to local and indigenous and local knowledge.
- Be capable of being used and contributed to by a wide range of stakeholders including those in low-technology environments.
- Serve as a mechanism to align systems, both existing and emerging and from small to multi-national scale.

The Decade's data, information, and knowledge framework will aim to create and maintain an approachable, robust, and extensible set of common and best practices across scales, sectors, and capacities, including methods enabling:

- exposing stakeholders' data, information, and knowledge in ways that meaningfully contribute to a global commons;
- automated discoverability of data and information;
- access to data while respecting controls where needed;
- interoperability, from datasets to infrastructures, allowing rapid integration, analysis, and synthesis; and
- modern and scalable data stewardship culture.

The framework will promote and enable:

- the use of standards and shared global frameworks;
- the participation by all stakeholders through partnership at multiple levels, including through common platforms, communities of practice, and coordination networks;
- targeted capacity sharing and development - matching opportunities and needs to capability and resourcing - as well as technology transfer, across networks to raise global capacity; and
- the delivery of tailored digital products and services to end-users across stakeholder groups through custom interfaces, dashboards, and other user experience solutions.

The Decade's digital framework will rely heavily on linked open data technologies. This approach will allow governments, commercial companies, non-profit organizations, science institutions, and others to maintain databases and systems in all manners of forms suited to their local needs, but also allow them to project interoperable representations of that information onto the web for use and rapid reuse in response to novel challenges. The implementation process will focus resources on ensuring that each institution and individual is responsible for projecting their most relevant data products onto the web in a fashion that can be rapidly and automatically reused to collectively build the ocean's digital twin. The result is that the initial development of a digital management framework for the Decade can proceed from and leverage existing systems without requiring massive investments in new infrastructure.

While some data-holding organizations (national, regional, global) have adopted their own data sharing policies, there is a lack of a single policy applicable to all available ocean data. While it may be impossible to reach agreement on a single data licence or policy across all partners, the system envisaged as part of the Decade will need to include a way to deal with the various policies, rules and restrictions applicable to data and information from a wide variety of sources. The Decade will embrace timely, "free and open" access, and use, re-use, and redistribution of the observational data for the greatest public good. Core data and knowledge products from the Decade will be made available in an open access, shared, discoverable manner and appropriately deposited in recognised data repositories[10].

2.4 Capacity Development

This section describes the principles, expected outcomes and priority activities for the Decade capacity development initiatives.

Human capacity to carry out ocean science is unequally distributed across the world, across generations, and across genders. The 2017 Global Ocean Science Report (GOSR) highlights the predominance of ocean scientists in the global north when compared to the global south, particularly in SIDS and LDCs. It also reveals a generational bias in many countries towards domination of ocean science by older generations, although many LDCs have a relatively young ocean researcher community. Female scientists comprise on average 38 % of the researchers in ocean science, about 10 % higher than the global share of female researchers across all scientific disciplines combined. However, gender balance differs significantly between different categories of ocean science and between countries.

Capacity development is an essential tenet of the Decade. It has the ultimate aim of achieving evenly distributed capacity across the globe, across generations, and across genders and thus reverse asymmetry in knowledge, skills and access to technology. Importantly, capacity development efforts must focus not only on capacity to do the science, but also on capacity to understand the societal relevance of the science, and to use the science to make more informed decisions for sustainable development. In this sense, the targets of capacity development as part of the Decade include not only scientists, but also the end-users of knowledge such as governments and policy-makers.

As all parts of the ocean are interconnected, the improved scientific knowledge and capacity to understand, observe and manage the ocean needs to be available equitably to all countries. The challenges and potential barriers to effective capacity development include fragmentation and a lack of coordination of

[10] Such repositories should be consistent with the IOC Oceanographic Data Exchange Policy or the relevant UN subordinate body data policy.

efforts, and insufficient investments by donors or lack of interest by Governments. The vast scale of ocean science can exacerbate these challenges.

The following set of principles that will underpin capacity development efforts during the Decade have been derived from discussions during the Global Planning Meeting, regional consultative workshops and with reference to accepted guidelines and standards. Building on past and present initiatives, capacity development carried out as part of the Decade needs to:

- Be an integral part of each Decade Action. In this sense, the endorsement criteria of actions under the Decade include a consideration of contributions toward capacity development, including in SIDS and LDCs.
- Be needs driven with investment in tools that can match the demand for capacity development to different opportunities.
- Be developed to respect regional and national diversity in terms of language and methods of learning.
- Privilege long-term partnerships and avoid ad-hoc, short-term efforts that are not part of a coordinated approach.
- Include a focus on mechanisms to accelerate the use of knowledge for societal wellbeing.
- Consider local and indigenous knowledge holders as both beneficiaries and providers of capacity development.
- Take into account the need for gender and generational balance.

The strategic framework (i.e. expected outcomes and priority activities) of capacity development efforts throughout the Decade is documented in Table 2.1. The proposed approach builds on that contained in the IOC Capacity Development Strategy 2015 – 2021, which itself was developed following an analysis of the capacity development plans and strategies of partner UN agencies. The adopted strategic framework therefore reflects the key elements of a wide range of approaches across the UN system.

Table 2.1: Strategic Framework of Capacity Development Initiatives as part of the Decade

Expected Outcome	Priority Activities
1. Human resources developed	• Academic and higher education opportunities • Continuous professional development • Sharing of knowledge and expertise / community building • Training • Actively improving gender balance
2. Access to physical infrastructure established or improved	• Facilitating access to infrastructure (e.g. research facilities, instruments, research vessels)
3. Global, regional, and sub-regional mechanisms strengthened	• Supporting regional and sub-regional organisations to be leaders in, and amplifiers of, capacity development
4. Development of ocean research policies in support of sustainable development promoted	• Supporting identification of ocean research priorities • Supporting development of national marine science management procedures and national policies
5. Visibility and awareness increased	• Ocean literacy (refer Section 2.4 for more detail)

	● Public information and communication (refer Section 2.5 for more detail)
6. Sustained, long-term resource mobilisation reinforced	● Mobilising in-kind and financial support for capacity development initiatives (refer Section 3.2 for more detail)

Capacity development during the Decade will contribute to the implementation of international agreements and frameworks including capacity building and transfer of marine technology targets of a new international legally binding instrument on conservation and sustainable use of marine biodiversity in ocean areas beyond national jurisdiction. Decade capacity development efforts will focus on, but will not be limited to LDCs and SIDS. The innovative technologies and scientific and observation as well as management practices developed during the Decade will be promoted and adopted globally by the global ocean science, observation and management communities, including through continuous professional development efforts.

Ocean Literacy is a specific form of capacity development that will be implemented throughout the Decade. Ocean Literacy is defined as 'the understanding of human influence on the ocean and the ocean's influence on people'. It is not only about increasing awareness on the state of the ocean, but also the tools and approaches that can transform ocean knowledge into actions that promote ocean sustainability.

Ocean Literacy as a concept and approach is radically evolving from being a tool applied in formal education and training contexts, to a tool and an approach for society as a whole, aimed at triggering actions towards ocean sustainability. A broad range of stakeholders can lead and benefit from Ocean Literacy. Based on the outcomes of a technical workshop in early 2019, the vision for ocean literacy during the Decade will be to enable and scale up action in all sectors of society regarding ocean sustainability in order to accelerate a fundamental shift in the way our ocean is managed. Throughout the Decade, Ocean Literacy will play a key role in developing sound public marine policy, promoting more responsible citizenry, promoting more ocean aware corporate practices, and encouraging young people to start a career in the blue economy or in ocean science.

During the Decade, Ocean Literacy activities will focus on four priority areas: advancing policy, formal education, corporate action, and community engagement. Ocean Literacy efforts will also support the development of National Ocean Literacy Strategies; developing collaborations, partnerships and networks; showcasing and endorsing Ocean Literacy efforts; and increasing research, monitoring and evaluation of the impacts of Ocean Literacy.

Partnership and cooperation will be essential pillars of all capacity development during the Decade. Collaboration between United Nations specialized agencies, research organizations, NGOs, private sector, national development cooperation agencies and others, that leverage partner capabilities, expertise, platforms, data, or joint funding opportunities, will lead to optimal efficiencies, effectiveness and impact of capacity development initiatives.

Advances in capacity throughout the Decade will be measured so that the impact of the Decade can be tracked, and so that broad trends including gaps in action can be identified and rectified. In addition to collection of data from individual Decade Actions (refer Section 3.3), the GOSR will provide a tool to measure global trends in ocean science capacity. The second edition of the GOSR, the GOSR2020, will be part of a transformative process to develop the required human and technical capacity in ocean science in the context of the Decade and the 2030 Agenda. The GOSR2020 will provide the baseline information against which to

assess progress in the development of capacity in the area of ocean science over the course of the UN Decade.

2.5 How to Engage in the Decade

This section provides information on the different engagement mechanisms that are envisaged for the Decade.

The Decade is everyone's Decade. It will be implemented for and by a diverse range of ocean stakeholders, whose active and sustained engagement will determine its success. Engagement in the Decade will take many forms that will evolve as the Decade rolls out. The overall goals of engagement include catalysing: (i) co-design and co-delivery of ocean science; (ii) sharing of knowledge in formats that will be proactively taken up and utilised by end-users (e.g. for use in policy or decision making for sustainable development); and (iii) innovative multi-actor, multi- and interdisciplinary partnerships to develop or use knowledge, technology or innovations.

Key stakeholder groups of the Decade are described below and Annex 4 provides a more detailed discussion of the potential role of each of these groups in the Decade, as well as targeted engagement mechanisms. The boundaries between these groups are fluid; for example, an individual could be a private sector scientist, who is a holder of local and indigenous knowledge. This fluidity emphasises the need for a flexible and broad approach to engagement with multiple entry points for multiple interests

- **Ocean science and knowledge generators** are arguably the largest and most obvious stakeholder group of the Decade. Ocean science and knowledge generators will design and generate crucial knowledge throughout the Decade. They will benefit from opportunities provided by the Decade for increased collaboration with a diverse range of ocean actors, increased recognition of the contribution of ocean science to sustainable development, and access to resources to support their work. Local and indigenous knowledge holders will make a particularly important contribution to the Decade by providing access to new information to complement scientific knowledge. They can benefit from increased access to partnerships with scientists in areas of common interest.
- **Early Career Ocean Professionals (ECOPs)** are a significant focus of the Decade and have been extremely active during the preparation phase. ECOPs can make crucial contributions to the Decade by actively participating in Decade Actions, acting as Decade ambassadors, and continuing the Decade's legacy post-2030. They will benefit from professional development opportunities catalysed through the Decade, and opportunities to join and lead scientific collaborations and partnerships. An ECOP Informal Working Group has been established to coordinate ECOP input to the preparation phase of the Decade.
- **Business and industry** is the primary commercial user of the ocean and can contribute significantly to the Decade in terms of resources, partnerships, and technology and innovation to enhance ocean science. Benefits to the private sector include enhanced scientific knowledge that can contribute to reducing business risks and creating opportunities for sustainable economic development. There has been strong engagement of the private sector throughout the preparation phase and mechanisms are being developed to continue this collaboration during implementation.

- **Philanthropic foundations** will play a role in the Decade through provision of resources, as well as outreach, advocacy and development of an enabling environment to catalyse broad support for Decade priorities. Robust engagement with foundations has commenced during the preparation phase and will continue throughout implementation of the Decade.
- **NGOs and civil society** are a diverse group that can play a multitude of roles in the Decade ranging from generation of science, to advocacy with national governments and policy makers, and education and outreach with local communities. Benefits to NGOs and civil society from engagement in the Decade are also wide and varied ranging from increased access to resources and innovative partnerships, and improved access to data and information for use in their activities.
- **The general public** will be targeted through the Decade communications strategy and ocean literacy activities. The Decade seeks to raise broad public awareness of the importance of the ocean to underpin a healthy planet. Communities worldwide will benefit from improved management of coastal resources and a healthier ocean. The general public will contribute to the Decade potentially via crowdfunding and citizen science initiatives. Ocean literacy efforts will target the general public and more specifically youth who are the next generation of ocean scientists and decision makers, and who increasingly play a role in influencing public opinion on issues of global concern (refer Section 2.4).

In addition to the above groups, **UN agencies, intergovernmental organisations and national governments** are essential actors at numerous points throughout the ocean science value chain from co-design to co-delivery, to use of generated knowledge, and the provision of resources. The role of these key stakeholders in the Decade is discussed in a number of sections throughout the Implementation Plan.

The ways in which stakeholders can engage in the Decade include:

Initiate or Participate in Co-Design of a Decade Action

Convening and supporting diverse groups of stakeholders to co-design and co-deliver transformative ocean science is a priority for the Decade. The Decade will be a failure if knowledge generated by Decade Actions is not shared and used to inform policy and decision making for sustainable development. To achieve this, the Decade will need to generate conditions for end-users of knowledge to collaborate with generators of ocean knowledge to align their respective objectives and priorities. This will result in the joint identification of general and specific requirements for scientific research and technology development and in the co-design of applications, services and products.

A **Global Stakeholder Forum** will act as a platform to bring together diverse ocean actors with common interests to facilitate connections and collaborations. The Forum will maintain an online database - structured by Decade outcomes and objectives - and a website for its members that will include Stakeholder Platforms, Implementing Partners, and National Coordination Committees (see below), amongst others. Members of the Forum will be supported to post collaboration ideas and opportunities on the website. Based on the results of a biennial scientific prioritisation exercises, the Decade coordination structures will use the Forum to stimulate discussion, generate ideas and convene interested parties for co-design and collaboration around priority scientific issues. The Decade coordination structures will actively work to connect stakeholders that are looking for collaboration opportunities and will share examples of successful co-design and co-delivery activities to inspire action in others. Decade coordination structures and other partners - including the Ocean Decade Alliance (see below) - will leverage resources for Decade Actions

that target co-design and collaboration initiatives (e.g. technical working groups, co-design workshops, or training initiatives for co-design approaches).

A **Decade International Conference series** will be organised to convene stakeholders to share information on progress towards the Decade objectives, and catalyse new initiatives and partnerships. Sessions within the Conference series will be dedicated to co-design collaborations. These conferences will take place at least every three years, potentially in conjunction with other major events within the ocean community. Governments will express interest in hosting these conferences with the aim of ensuring diversity in the location of the events throughout the Decade.

Propose and Implement a Decade Action

The Decade coordination structures will launch periodic Calls for Action for programmes and projects. Proponents can respond to these Calls for Action with ideas for Decade Actions that meet the eligibility criteria described in Section 2.2. Submitted proposals can already have secured resources, or require additional support. In this latter case, the Decade coordination structures will play a matchmaking service to match selected Actions with available resources. Proponents can submit Actions in the form of activities or contributions at any time and approval of these will be decided on a rolling basis by the coordination structures.

Stakeholder institutions (e.g. research institutes, NGOs, universities) that are committed to the vision and mission of the Decade and that are making significant and sustained efforts to implement Decade Actions will have the opportunity to become **Decade Implementing Partners**. Potential partners will submit an online application form to the Decade coordination structures to demonstrate the alignment of their strategic plans and/or work programs with the Decade vision, outcomes and objectives, and identify the Decade Actions that they are (or are proposing to) implement. The Decade website will list Decade Implementing Partners and they can use the Decade logo in their visibility and communications materials. Individual Actions carried out by partners will follow the process described in Section 2.2 for endorsement.

Create or Participate in a Stakeholder Group

National Decade Coordination Committees will coordinate actors at the national level. They will be a platform for the co-design and co-delivery of Actions amongst national stakeholders, and facilitate national access to Decade-related benefits such as data, products, science-policy advice, or capacity development. The committees will be multi-agency and multi-stakeholder groups. Examples of the functions that these Committees will play include:

- Promotion of awareness amongst a broad range of national stakeholders in relation to Decade priorities and progress.
- Facilitate the planning and implementation of national Decade Actions including promotion of co-design initiatives involving diverse actors.
- Coordinate the provision of national inputs to international or regional Decade programmes.
- Ensure that outputs of Decade Actions are available to the national community.
- Lead outreach, education and communication at a national level.
- Encourage and facilitate the provision of necessary national resources and logistical support for the implementation of Decade Actions.
- Encourage voluntary national contribution to the costs of international coordination.

- Host regional or international meetings related to the Decade.

Decade Stakeholder Platforms will be groups of ocean actors that have an interest in working together to contribute to the Decade vision and mission. They will be important forums to stimulate co-design and co-delivery of Decade Actions. The organisation and membership of Stakeholder Groups and the activities that they undertake will be diverse. Many relevant groups already exist and these will be encouraged to register as Decade Stakeholder Platforms. This will also inspire new groups of interested institutions and individuals to come together around Decade priorities and Actions. Stakeholder Platforms will be predominantly self-organised groups that could convene on a geographic basis (e.g. national, regional or for a given ocean basin), for a specific theme (e.g. deep ocean, nutrient pollution, coral reef biodiversity, underwater cultural heritage), and/or for a particular stakeholder group (e.g. NGOs, aquarium managers and operators, or private sector). The Decade coordination structures will recognise Decade Stakeholder Platforms upon submission of an online application that describes the objectives, activities, and membership, as well as the alignment with the vision and mission of the Decade. The Decade website will list recognised Stakeholder Platforms and they can use the Decade logo in their visibility and communications materials. Actions carried out by Stakeholder Platforms or their members will follow the process described in Section 2.2 for endorsement.

Join the Ocean Decade Alliance

The goal of the Ocean Decade Alliance (the Alliance) is to catalyse large-scale commitments towards the Decade through targeted networking, resource mobilization, and influence. Alliance members – both institutional and individual - will lead by example and motivate action by other stakeholders. Members will be part of a highly visible platform of supporters of the Decade. The Alliance would provide a mechanism to organize members' commitments and resources via a 'virtual resource pool' into which members of the Alliance could commit in-kind or financial resources to implement priority Decade Actions. Alliance members would include governments, industry, civil society, scientific institutions, philanthropic organizations, and United Nations agencies. The following criteria will guide decisions on Alliance membership: (i) demonstrated sustained commitment to supporting ocean science through research, capacity development, innovation and technological development, and/or communications and awareness raising; (ii) demonstrated willingness to act as a high-level ambassador for the Decade and to lead by example thus motivating action in other stakeholders; (iii) significant financial or in-kind support to Decade Actions; and (iv) commitment to UN goals and ethical principles. Membership of the Alliance would initially be for a period of three years that would be renewable based on the continuing commitments. Different levels of membership will be available depending on the scale of resources committed to the Alliance. Section 3.2 provides further detail on the functioning of the Alliance as a resource mobilisation mechanism.

Share Decade Knowledge

Ocean science needs to move beyond peer-reviewed publications as the primary measure of success and focus on the benefits and impacts created through the uptake and use of science. The Decade will create the conditions for generators of ocean knowledge to share information with relevant end-users to inform decision-making and policy for sustainable development. Such information will need to be shared in forms and via mechanisms that are widely accessible by end-users. The stakeholder fora and conferences described in the preceding sections will provide for exchange of information along the whole ocean science production chain and will fulfil some of this need. But this will not be sufficient to achieve the desired result. The Decade will need to proactively develop additional mechanisms ensuring ongoing, real-time

connections between end-users needing knowledge and the actors generating that knowledge. Such connections will need to work in both directions i.e. generators of knowledge need to be able to identify and target relevant end-users, and end-users need to be able to identify and target potential sources of information that they require.

Throughout the Decade, new digital products focusing on the transfer and sharing of knowledge will be developed and deployed as part of the data, knowledge and information management framework, which is described in detail in Section 2.3. These products will be jointly developed by generators and end-users of knowledge and will be based around principles of dynamic matchmaking that aim to match supply of and demand for information in relation to priority issues. These mechanisms will work at all levels of technical readiness, including the cutting edge. They will be closely linked to capacity development and transfer of marine technology initiatives to ensure that end-users have the skills needed to interpret and use knowledge. Alignment of these products with generally recognised communities of practice will be an efficient way of organising data sharing, as it will allow leveraging of existing networks and relationships. Several such thematic mechanisms can be created during the Decade depending on end-user priorities. Examples include products to share knowledge on coastal zone management, marine spatial planning, establishment and monitoring of marine protected areas, the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, underwater cultural heritage, fisheries and aquaculture management, or mitigation of and adaptation to climate change.

Communicating the Decade

Decade stakeholders at all levels will be encouraged to become advocates of the Decade who will in turn communicate about, and inspire action for, the Decade in their networks and more broadly. The Decade communications strategy will provide a framework for this communication. The strategy aims to enhance global understanding of the importance of a healthy global ocean to underpin a healthy society and a sustainable global economy. It aims to generate excitement around the global ocean environment as an exciting, adventurous and largely unexplored frontier. It will provide information to stakeholders on i.e. what the Decade will achieve; why they should get involved; and how they can provide their support. The strategy will use the following key messages in its outreach to stakeholders:

- The ocean is a place of wonder and one of the last unexplored frontiers on the planet.
- Humans need a healthy ocean, but the ocean is in trouble.
- The ocean is a key ally in the fight against climate change and is vital to the production of food.
- Our understanding of the ocean and its contribution to sustainability depends on our capacity to conduct and use effective, global ocean science to make real, transformative change.
- In order to achieve SDG 14 and many other SDGs we need greater ambition, stronger partnerships and more investment in innovative, science-based solutions.
- The Decade provides a once-in-a-lifetime opportunity to transform the way we use global ocean science to generate solutions to the most critical problems facing the planet.
- The success of the Decade will depend on political leadership, public support and collective action at a global level.

The Decade communications strategy will invite all stakeholders to become part of **"Generation Ocean"** (or **"GenO"**) to deliver the Decade vision of the 'science we need for the ocean we want'. The GenO brand will provide a clear call to action for everyone who wants to become part of the Decade's efforts to understand the ocean and to take the actions needed to protect it for present and future generations. The vision is that "Generation Ocean" will convene all living and future generations to build a new kind of society

by 2030, one in which all of humanity will use the best available science and knowledge to deliver the ocean we need for the future we want. The inclusive nature of the brand will become clearer as it is developed across digital and print media, and takes the shape of a full communications campaign, which will feature testimonials of citizens of all ages and walks of live about how they interact with the ocean, and about how they wish to join a new generation for the benefit of humankind and planet alike.

Keep Informed

Stakeholders can remain informed about Decade priorities, actions, events, and progress via the website (oceandecade.org) and social media. Via the website, they can subscribe to the newsletter and register to receive mail-outs from the Decade coordinating structures.

Part 3: Implementation of the UN Decade

Part 3 describes the implementation of the Decade. It presents the governance and coordination framework of the Decade, the mechanisms for resource mobilisation, and the process to measure progress.

3.1 Governance & Coordination Framework

This section describes: (i) the intergovernmental process required to guide and report on the progress of the Decade implementation; (ii) the mechanism to provide high-level, strategic oversight of the Decade; and (iii) the role and functions of various implementing and coordinating entities.

Governance Framework

UN General Assembly & IOC / UNESCO Governing Bodies

The Decade is a UN-wide initiative endorsed by the UN General Assembly (UNGA). The 2017 UNGA Resolution (A/RES/72/73) invites *inter alia* the Secretary-General to inform the UNGA on the implementation of the Decade, based on information to be provided by the IOC.

The Governing Bodies of the IOC will provide intergovernmental oversight of the Decade and consider regular reports prior to their review by the UNGA. Established as an advisory body to the IOC, the Decade Board (see below) will report to the Governing Bodies via existing processes i.e. the regular meetings of the IOC Assembly and Executive Council. The IOC Governing Bodies will report to UNESCO and the UNGA via existing processes.

Decade Board

The Board of the Decade will be responsible for the high-level, strategic oversight of the Decade throughout the implementation phase. It will lead the process to set the strategic agenda, endorse programmes and Decade Collaborative Centres, and review the performance of Decade Actions. Board members will also contribute to the assessment of resource requirements for Decade Actions and raise awareness about the Decade. The Board will comprise up to 20 members including representatives of UN agencies and relevant experts. Open calls for nominations will be used to identify Board members. Expertise, geographic,

generational, and gender balance will be taken into account in the selection of members. Membership will be on a rotational basis with members to serve two-year terms that are renewable for a second mandate, with processes developed to ensure staggered turnover of Board members. The Chair of the IOC will chair the Board. The Board will establish task groups and/or invite external experts as needed to address specific issues or tasks. Annex 4 contains the proposed Terms of Reference for the Board.

UN DOALOS and UN Oceans Agencies

UN Oceans, the UN interagency coordination mechanism for ocean affairs, and its members are invited by the UNGA resolution 72/73 to collaborate with IOC in the preparation of the Decade. To facilitate the required level of engagement, UN DOALOS (as the Secretariat and focal point of UN-Oceans) will be represented on the Decade Board. Three other seats on the Decade Board will be reserved for UN agencies with agencies to be nominated through UN Oceans (these may be on a rotational basis as agreed by UN Oceans).

Figure 3.1 illustrates the elements of the governance framework for the implementation phase of the Decade.

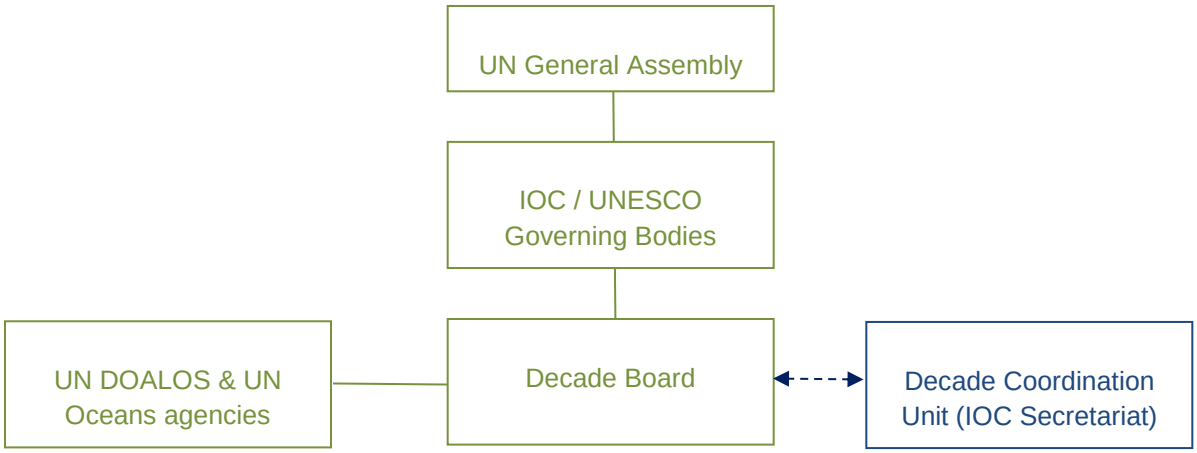

Figure 3.1: Governance Framework for the Decade

Coordination Framework

Decade Coordination Unit

The Decade Coordination Unit will be located within the IOC Secretariat in UNESCO Headquarters. Its three main functions are to act as the: (i) primary coordination office for the implementation of Decade Actions; (ii) Secretariat for the Decade Board; and (iii) Secretariat for the Ocean Decade Alliance. The Coordination Unit will work in close collaboration with the Secretariat of other UN bodies and may include seconded staff from UN agencies and programmes to ensure a well-coordinated inter-agency approach. Alternatively, a more decentralized approach may be explored by appointing personnel within UN body Secretariats to support the coordinating functions of the Decade.

The Unit will develop biennial action plans and resource needs assessments; coordinate and consolidate information from the various programmatic offices to facilitate monitoring and reporting; coordinate

communications and outreach; endorse Decade projects, activities and contributions; and provide Secretariat support to the Board and the Alliance. It will also facilitate liaison between the Global Stakeholder Forum and the Decade Board. In terms of the Alliance, the Decade Coordination Unit will perform the following tasks:

- Promote the development of the Alliance membership by proactively seeking engagement of high-level supporters.
- Facilitate the process of membership of the Alliance in accordance with the eligibility criteria defined, and when relevant, conduct due diligence process for membership of companies and private entities in line with UNESCO/UN rules.
- Identify and communicate resource needs for priority areas of the Decade and play a matchmaking service linking needs to available resources.
- Keep track of financial commitments provided by Alliance members, through the annual Decade reporting process.
- Facilitate the convening of Ocean Decade Alliance events and related outreach/communication activities.

The Decade Coordination Unit will work with UN bodies, programmes and conventions to ensure high visibility and representation of the Decade in UN forums, conferences, and events. This will include the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), which may be activated at the request of UN agencies to address relevant priorities identified in the Decade Implementation Plan.

Decentralised Coordination Offices and Collaborative Centres

The governance framework allows for different types of decentralised coordination structures at the programmatic or regional level. Not all programmes or regions will require the establishment of a new coordination structure, as existing structures may already exist that can be used or adapted: Such situations will be discussed on a case-by-case basis with the Decade Coordination Unit. Where a new structure is required, the two options that exist are:

- *Decade Coordination Offices* will be hosted by Member States as IOC/UNESCO offices and will require the establishment of a Seat Agreement with the host Member State and the provision of financial resources by the hosting Member States through IOC/UNESCO or other UN frameworks[11].
- *Decade Collaborative Centres* will be hosted by one or more countries or an international organization engaged in Decade activities but will not require the establishment of a dedicated UNESCO/IOC office. Decade Collaborative Centres would need to be endorsed as recognised Decade entities by the Decade Board and have recognized international expertise and capacities to perform such functions.

Figure 3.2 illustrates the elements of the coordination framework for the implementation phase of the Decade.

[11] Individual UN Bodies and Conventions have their own procedures to establish decentralised structures that will need to be adhered to.

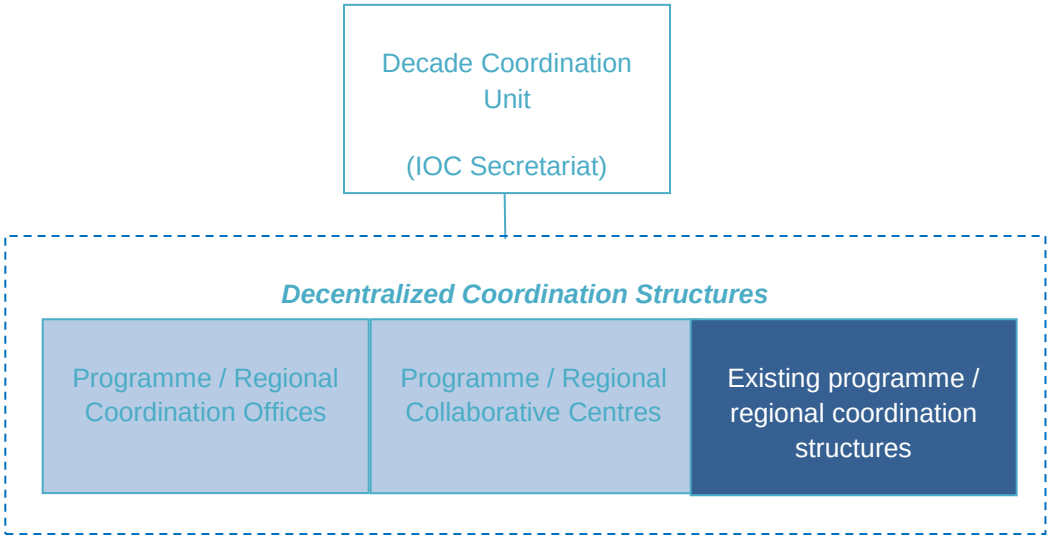

Figure 3.2: Coordination Framework for the Decade

Decade Coordination Offices and Collaborative Centres will form part of the overall Decade coordination framework and will report to the Decade Coordination Unit. The primary functions of the Coordination Offices and Collaborative Centres will include:

- Provide information to actors desiring to implement Actions under the Decade and raise awareness of Decade Actions across stakeholder groups, including discussions with potential scientific and financial partners.
- Review requests for endorsement process for Decade projects, activities and contributions falling under their mandate and provide recommendations to the Decade Coordination Unit.
- Create opportunities for exchange and synergies between different actions and actors including facilitation of new partnerships.
- Track endorsed Decade Actions and prepare consolidated operational and financial reporting of Decade achievements and impacts according to a set of high-level core indicators.
- Organize and facilitate communications and outreach activities.
- Build technical and scientific capacities to support specific Decade Actions.
- Organize and participate in Decade implementation review meetings and other relevant meetings and discussions linked to the Decade implementation.

In line with the United Nations' focus on Africa, LDCs and SIDS, the Decade will aim for geographic diversity in the location of Decade Coordination Offices and Decade Collaborative Centre.

3.2 Resource Mobilisation

This section describes the different financing mechanisms that exist for the Decade for coordination and Action costs.

Currently, national governments are the key sources of financing for ocean science. The volume of national investment in ocean science differs around the world; however, on average only 1% of the national research budgets supports ocean science[12]. This is a small proportion compared to the estimated US$ 1.5 trillion contribution of the ocean to the global economy in 2010. If the ambitions of the Decade are to be realised, national funding for ocean science will need to increase significantly.

Philanthropic foundations are also important sources of financing for ocean science and can play complementary roles in awareness raising, education, and advocacy. The Decade provides a strong framework for convening philanthropic foundations around a set of common ocean science priorities. Annex 4 discusses engagement with philanthropic foundations.

The resource base for the Decade will need to be broad and flexible and no single agency or actor will manage all Decade resources. The mobilization of resources for the Decade will take a variety of forms and all actors need to be advocates for identifying and securing support.

Both financial support and in-kind support will be mobilised for the Decade. Support will be required for the implementation of programs, projects and activities under the decade ("**Action costs**"), and for operational activities including the functioning of the Decade Coordination Unit, the costs of regular meetings and review processes, and other related operational costs ("**coordination costs**").

The volume of Action costs mobilised through the Decade will only be limited by the scope and ambition of the Decade itself. Biennial resource needs assessments will be prepared by the Decade Coordination Unit and will include information on coordination and Action costs. Information on secured resources and resource gaps will used to match needs with available resources.

The volume of resourcing needed for coordination costs will be disproportionately skewed to the start-up phase. Post-start up, the coordination costs should be relatively predictable thus allowing medium to long term resource mobilization planning. Resources will be mobilized centrally to support the coordination and administration functions of the Decade Coordination Unit. This cost will be in the order of US$1.3 million per year. Mobilised resources will also support selected decentralised coordination functions. Wherever possible, existing decentralised coordination structures will be used to minimise such costs.

All support – financial or in-kind, will be tracked using common metrics regardless of mobilisation mechanisms. This will ensure that there is robust and consolidated information on the resources invested in the Decade and will allow the benefit of the Decade to be analysed and communicated.

Figure 3.3 and the following text describe the different ways in which a partner can contribute financial or in-kind resources to the Decade to support Actions or coordination costs. All resource providers - regardless of the mechanism adopted - will be recognised for their contributions to the Decade either through the Ocean Decade Alliance or on a regularly updated 'honour roll' of contributions to the Decade that will be included on the website.

[12] Data for the period 2013-2017 taken from GOSR2020 in prep.

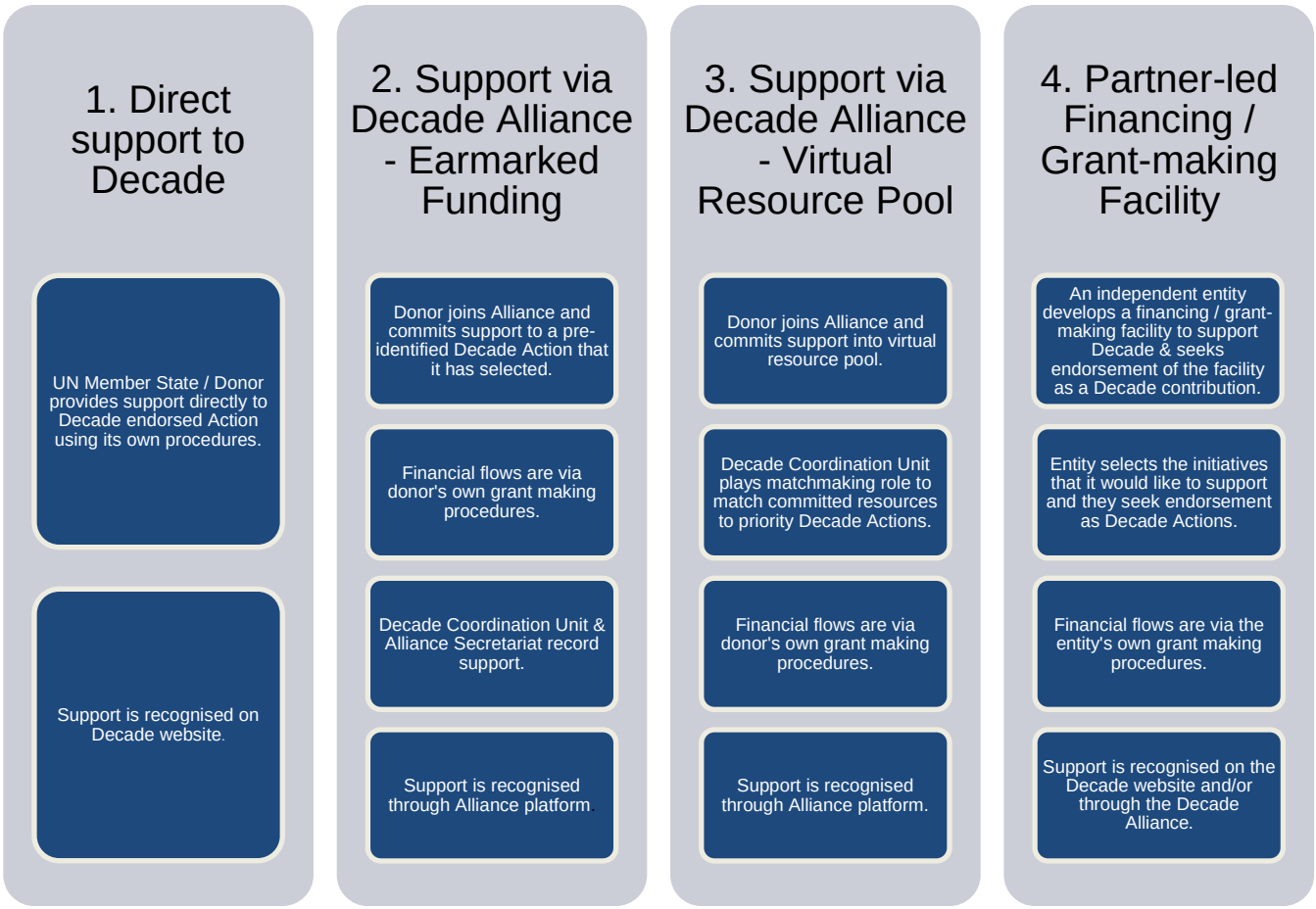

Figure 3.3: Financing Mechanisms for the Decade

Mechanism 1: Direct support for Decade Actions and Coordination Costs

Under this mechanism, existing processes will provide direct support to Decade Actions and coordination costs. Much of this support is likely to come in the form of Member State government funding via UN agencies. For Decade Actions, nationally funded research projects or nationally determined voluntary contributions such as research cruises, research and sustained measurement networks, technical training, or data systems will also be essential forms of direct support. Multilateral or regional funders or philanthropic foundations could also fund Actions and will be important partners throughout the Decade.

The mechanisms for direct support to coordination costs are likely to vary depending on the level of the governance structure. At the level of the Decade Coordination Unit, the predominant form of funding is expected to be through direct financial and in-kind support for operations (e.g. through the secondment or loan of staff). Such support will be in the form of extra budgetary resources from Member States or external financial partners. Further in-kind resources at the central level could include hosting and organization of scientific meetings or workshops (e.g. stakeholder conferences or Decade Board meetings), communications or outreach campaigns, discrete technical assistance or consultancy projects, or support for participation in global events linked to the Decade.

At the programme and project level, hosting of a Decade Programme Office or Decade Collaborative Centre by a Member State will be one of the major mechanisms to provide in-kind support. Contributions from Member States may also include extension of existing support mechanisms to cover relevant Decade administration and coordination functions, or secondment and loan of staff to support decentralised coordination structures.

Mechanisms 2 & 3: Support via Ocean Decade Alliance

The Ocean Decade Alliance (refer Section 2.5) will be a key component of the resource mobilisation efforts for the Decade, focusing on significant voluntary resource commitments. The Alliance is not a funding or grant making facility; rather, it is a platform to connect large-scale resource providers and proponents of Decade Actions. There are two options for support through the Alliance. Under the first option, members of the Alliance earmark their commitments to Actions or coordination costs that they have pre-identified as wishing to support. Under the second option, Alliance members would commit resources to a 'virtual resource pool' and the Decade Coordination Unit would play a matchmaking service to link commitments to proponents of Decade Actions that need resources. In both cases, financing would be directly from the Alliance member to the proponent of the Decade Action.

Mechanism 4: Partner-led Financing / Grant Making Facility

Under this mechanism, an independent entity with its own grant making capacity (e.g. a philanthropic foundation, an NGO or a government entity) will express the desire to mobilise resources to support the Decade Actions and offers to act as a hub for mobilising financial contributions from other donors. Individual proposed Actions considered for funding by the entity under the financing and grant-making facility are submitted to the Decade Coordination Unit or Decade Board for endorsement (depending on the scale of the Action). The independent entity who is proposing this contribution to the Decade can choose to join the Alliance and have its engagement recognized via that structure.

3.3 Measuring Progress

This section outlines the process to monitor Decade progress and to evaluate the impact of the Decade. It also describes the major review processes embedded into the Decade, including the review of the Implementation Plan.

Measuring and annual reporting of a set of high-level operational, financial and scientific indicators will provide information on Decade progress and impact. Operational indicators will collect information on the number and type of Decade Actions including information on their geographic location, their alignment with Decade outcomes and objectives, and the diversity of key stakeholders engaged in the Actions. Information on the reach of engagement, communications and outreach activities will also be collected. Information on annual spending of Decade Actions, secured and unsecured resources, and data on the commitments made through the Alliance will be collected to track investments. Scientific indicators will be developed to measure the outcome of the science actions that will have been implemented, in terms of: (i) new knowledge on emerging issues against the current knowledge baseline; (ii) development of standard operating procedures for research, observations and collection of data; (iii) predictability capacity of models; and (iv) progress in science capacity needed to implement the agreed science actions.

Proponents of endorsed Decade Actions will be required to report annually on these indicators via online templates that will facilitate reporting and allow for disaggregation of data. Decentralised coordination structures will have the responsibility to collect data for indicators for projects and activities included within their remit. The Decade Coordination Unit will collate information on indicators from the decentralised coordination structures and will prepare an Annual Progress Report for validation by the Decade Board that analyses these indicators.

In addition to the specific data collected on Decade Actions, the Decade will benefit from, and contribute to, regular evaluation and reporting processes within the UN system including the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects (the World Ocean Assessment) and the Global Ocean Science Report.

Table 3.1 illustrates the review processes of the Decade implementation phase.

Table 3.1: Decade Review Processes

	Description	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	(2031)
Biennial Action Plan	High level work plan showing priority Decade Actions for upcoming two-year period.											
Resource Needs Assessment	Analysis of required vs. secured funding for Actions identified in Biennial Action Plan. Used in discussions with Alliance and in resource mobilization efforts.											
Review and Update of Decade Action Framework	Review of progress in achieving scientific objectives and orientations and review of Decade Action Framework to adapt and incorporate emerging scientific issues and priorities.											
Annual Progress Report	Brief yearly overview of high-level operational, financial and scientific data as well as case studies and success stories.											
Biennial 'State of the Decade' Report	Flagship publication presenting major advances of the Decade in terms of knowledge generation, uptake and capacity development.											
Mid Term Review	Comprehensive review of progress at mid-way of implementation against vision, outcomes and objectives. Includes consideration of operational, financial and scientific aspects and recommendations for revisions to the Implementation Plan.											
Implementation Plan Update	Update of Implementation Plan based on findings of mid-term review.											
Final Review	Comprehensive evaluation of Decade taking into account progress against vision, outcomes and objectives.											

Annex 1: Executive Planning Group Members

Executive Planning Group Members

Francisco A. Arias-Isaza, Director General, Institute for Marine and Coastal Research, Colombia

Elva Escobar Briones, Institute of Marine Sciences and Limnology, Universidad Nacional Autónoma de Mexico, Mexico

Karen Evans, Senior Research Scientist, Oceans and Atmosphere, Commonwealth Scientific and Industrial Research Organisation, Australia

Kristina Gjerde, Senior High Seas Advisor, Global Marine and Polar Programme, IUCN

Christa von Hillebrandt-Andrade, Manager, NOAA National Weather Service Caribbean Tsunami Warning Program, Puerto Rico

Anna Jöborn, Director, Swedish Agency for Marine and Water Management, Science Affairs Department, Sweden

Youn-Ho Lee, Professor/Principal Research Scientist, Korea Institute of Ocean Science and Technology, Republic of Korea

Suzan Kholeif, Former President, National Institute of Oceanography and Fisheries, Egypt

Jens Kruger, Manager, Ocean Affairs, Pacific Community, Fiji

Atmanand Malayath, Director, National Institute of Ocean Technology, India/Chair, IOCINDIO (UNESCO)

Margaret Leinen, Director, Scripps Institution of Oceanography/Vice Chancellor, University Of California-San Diego, United States

Craig McLean, Acting Chief Scientist, Assistant Administrator for Research, National Ocean and Atmospheric Administration, United States

Linwood Pendleton, Global Ocean Lead Scientist, World Wide Fund for Nature / International Chair of Excellence, European Institute for Marine Studies, Brest, France

Fangli Qiao, Vice-Chair, National Scientific Committee of Global Change and Mitigation, Ministry of Science and Technology, People's Republic of China

Ricardo Serrão Santo, Member of the European Parliament, Portugal (member until October 2019)

Sergey Shapovalov, Head, Centre for Coordination of Ocean Research, Russian Federation

Dismore Gilbert Siko, Director, Department of Science and Technology, South Africa

Mitsuo Uematsu, Emeritus Professor, University of Tokyo, Japan

Martin Visbeck, Head, Research Unit “Physical Oceanography”, GEOMAR Helmholtz Centre for Ocean Research, Kiel University, Germany

Annex 2: Overview of Outcomes of Global and Regional Consultative Workshops

The First Global Planning Meeting in May 2019 and the following regional consultative workshops covering nine ocean basins identified a wide range of issues related to scientific priorities as well as capacity development needs to be considered under each of the Decade outcomes. This Annex provides a high-level overview of the outcomes of the discussions in these meetings. It does not identify all issues raised and a detailed analysis of the discussions can be found in the workshop reports for each meeting on the Decade website. The discussions and outputs of each meeting were used to shape the Decade Action Framework contained in Section 2 of the Implementation Plan and will provide the basis for the development of regional priorities for Decade Actions throughout implementation.

A Clean Ocean:

1. Identify primary sources, pathways and fates/spreading of pollution and creation of a global pollutants database (including pesticides, hydrocarbons, metals, plastics). Discussions highlighted the need to better understand emerging pollutants (including light, noise, and pharmaceutical pollutants), and to use technology to monitor, track and map marine pollutants. Discussions emphasised the need for capacity and funding opportunities within all regions.

2. Demonstrate measurable impacts of pollution and combined effects of climate change and other stressors on ecosystems/organisms and human health. Discussions identified the need for risk assessment methods to understand impacts on biota and human health under climate change and taking into account multiple stressors. The discussions identified the remobilisation of contaminants due to climate change and hazardous algal blooms as priority issues.

3. Define what clean means i.e. identify acceptable levels of pollution to set thresholds values and define ecological boundaries/maximal levels of pollutants as well as their half-life and rates of biodegradation for optimal functioning ecosystems. This includes understanding of the tolerances of species and ecosystems to pollutants.

4. Determine ways of eliminating, reducing, or mitigating effects of pollution. This includes improved science based management tools for remediation and waste management, including management at sea. Discussions highlighted the need for research into improved methods of disposal or recycling of marine litter and promotion of the circular economy approaches to reduce litter. The development of methods for effective transboundary pollution management was also identified.

5. Foster interdisciplinary in support of positive change including facilitating collaboration with social sciences (e.g. to allow assessments of the socio-economic costs of degraded ecosystems or better understand the drivers of behaviour change). Methods to capture and incorporate local and indigenous knowledge were also highlighted as a priority.

A healthy and resilient ocean:

1. Understand of structure and function of the ecosystems, as well as interdependencies between ecosystems (particularly for the mesopelagic zone and other realms) to maintain or restore a healthy and resilient ocean. This broad issue includes understanding global marine processes and the role of ecosystems and species, including in poorly studied areas, such as the deep ocean. Specific priorities identified include strengthened marine biodiversity inventories through DNA barcode registrations, definition of indicators of dynamic ecosystems services, tools to evaluate ecosystem resilience to regime shifts and to better understand functional ecological connectivity to underpin marine protected area design, improved understanding of land-ocean interactions and drivers affecting ecosystem health.

2. Understand the impacts on ecosystems of human activities including new, synergistic, and cumulative impacts of climate change, the growing Blue Economy and associated economic opportunities including geoengineering. Much discussion focused on the need to better understand multi-stressor/multi-user environments including under climate change scenarios. Discussions identified the need for tools to evaluate the cumulative impacts of high intensity fisheries on ecosystems as well as understanding the impacts of land-based pollutants, including sedimentation. Enhanced institutional capacity was identified as a means of understanding and resolving trade-offs among ocean users.

3. Promote ocean literacy and science-policy dialogue including expanding use of citizen and user-oriented (e.g. tourism operators, fishers) data collection, and use of local and traditional knowledge and practices. Improved understanding is seen as being driven by greater levels of outreach from scientists to the public and policy makers. Discussions identified the need for research to develop innovative tools to promote compliance with ocean policies, and the need for improved understanding of the causes and impacts of conflict related to the use of ecosystems and ecosystem services.

A predicted ocean:

1. Improve scientific understanding of ocean processes/ecosystems (including future states and how these processes affect the global climate) to improve models for robust predictions (initialization of models as the basis for mechanistic understanding). Discussions stressed the need for observations for weather and climate forecasts at all scales and identification of ocean forecast services that are required for the benefit of society. There was significant discussion regarding ocean observations including the need to include human use and interactions and the need to include deep ocean observations. Overall there is a need to enhance and expand observational capability to improve models for robust predictions, including risk assessment and uncertainty analysis. Specific mention was made of the need to generate high-resolution bathymetry and wind observations and to develop ocean acidification forecasting capabilities.

2. Improve modelling (coupled models, coupling physical and biological models), integrated with a focus on particular timescales i.e. short for hazard warning and operational services, and seasonal to decadal to centennial. Discussions highlighted the need to develop novel climate coupled models (ocean-atmosphere-land-ice) and to explore non-numerical models that include artificial intelligence for both physical and biological predictions. Other discussions focused on the need to develop coupled models that integrate biological, physical and socio-economic factors relevant to the SDGs. There is an identified need to downscale global models to regional levels to allow tailored information needs to be met.

A safe ocean:

1. Research aimed at reducing and minimizing impacts of various changes (risk reduction) through adaptation and mitigation and at assessing social and physical vulnerabilities. There is a need for a better understanding of the relationship between human health and ocean health including in relation to pollutants and algal blooms. Discussions advocated for tools to improve basin-wide, multi-scale understanding of hazard vulnerabilities, improved regional risk profiles, and social and coastal vulnerability mapping. Lack of knowledge of sea level rise was considered a priority given the possible amplification of other types of risks. Discussions raised the importance of understanding risks associated with increased and changing ocean traffic and the need for technology development opportunities to reduce these risks.

2. Impact-based forecasting to better communicate impacts of hazards. Discussions highlighted the need to convert global ocean forecasts into local impact and early warning systems. Quantification of risks to strengthen preparedness and resilience was identified as important. The integration of local and indigenous knowledge into early warning systems was discussed as a priority.

3. Increase data availability (including baseline data, real-time dynamic data) in support of multi-hazard early warning systems and to improve models for tropical cyclones, hurricanes and all extreme events. Discussions highlighted the need to improve tsunami warning systems including improvement of bathymetry and topography data, the use of GNSS crustal movement data and the need for landslides and submarine landslides to be monitored. The need for tools to model extreme events to enhance coastal zone planning and management was highlighted, as was improved forecasting for intensity and pathways of storms.

A sustainably harvested and productive ocean:

1. Increase knowledge on ecosystem function and sustainability at the ecosystem level (rather than at the species level) and strengthened research on trophic gaps to better understand the inter-relationships between species. Discussions focused on the need to improve fish stock assessments that can be shared across regions and used to identify ecosystem thresholds and develop indicators of sustainability. Discussions stressed the need for tools to allow an adaptive ecosystem approach to fisheries management including tools for integrated ecosystems assessments. Marine spatial planning was identified as important to inform the diverse and changing demands on ocean space. Discussions noted that the Decade should also work with end-users in institutions to increase the speed of uptake of science and thus facilitate more reactive decision-making. Improved tools for effective area based management were identified as a priority.

2. Increase knowledge on impacts of the Blue Economy activities and climate variability change on fisheries, resources and ocean/seabed ecosystems health and sustainability as well as understanding of the trade-offs between uses of the ocean and its resources. Discussions included consideration of the effects on fisheries and identified the need for increased understanding of ecotoxicology and fish diseases, chemical and biological impacts of aquaculture and the effects of IUU fisheries. The development of a new generation of methods to model fisheries in the face of a rapidly changing marine environment was recommended. In terms of effects on marine ecosystems, priorities include tools to measure the sustainability of environmental assets, increase the understanding of anthropogenic pressures on marine ecosystems and better understand marine ecosystem functioning. Knowledge to

support development of sustainable / low-impact marine technologies in the energy and minerals sectors was identified as important.

3. Understand the future of food production from the ocean. Key issues that were identified include improved tools for value chain analysis in the fisheries sector, increased understanding of the role of coastal / small scale fisheries in underpinning wellbeing in SIDS, improved tools for sustainable fisheries including fish catch and effort data collection, and knowledge to support sustainable aquaculture.

4. Foster interdisciplinary science and inclusion of traditional and local knowledge. Discussions included the need for a better understanding of the socio-economic value of ocean products and services, including the role of fisheries in food security. The need to integrate empirical knowledge in the design of research projects was highlighted, as was the strengthening of the science-policy interface. The better integration of social and natural sciences in the co-design and delivery of ocean science was seen as a potential tool to understand and resolve conflicts between different users, integrate different knowledge systems and more effectively communicate science to policy makers and communities.

A transparent and accessible ocean:

1. Address data access, management and use issues. This issue was seen as one of the top priorities of the Decade. Priorities that were identified included improved access to data, including data that are dispersed, duplicated or difficult to access; data sharing and standardization of data collection, including policies to access and exchange of data and information; and the need for infrastructure to streamline data sharing processes. It is considered vital that by the end of the Decade a common operating system for ocean data is developed and operational. Discussions also focused on the need to build national & regional capacity and develop data platforms and centres with a focus on SIDS and LDCs. An inventory of existing and potential data platforms and technologies for collecting and sharing data was recommended. Discussions identified the need for a digital revolution in ocean data by developing artificial intelligence, big data, disruptive technologies and other tools.

2. Capture local and indigenous knowledge. Discussions noted that monitoring should include not only instrumental observations, but also different sorts of other knowledge, including indigenous knowledge in places where it is relevant. There is a need to map potential applications of traditional knowledge, to recognise the sensitivities around sharing of traditional knowledge, and build that recognition into the collection process.

3. Develop and deploy mechanisms to validate that systems and data meet end-users needs and assess impacts on societal outcomes. Discussions focused on user driven data and how to integrate data/information and convert it to useful data products. They also stressed the importance of improving data accessibility and understanding user requirements including visualisation tools.

4. Promote UN Platform and international policy on data management. Discussions stressed the need for better coordination between UN agencies at the global and regional level and the development of an internationally developed and recognized data policy.

5. Promote and support ocean literacy for a wide range of target groups. Taking note of the low level of ocean literacy, which requires two-way literacy between scientists and the media, and other “non-scientific” audiences as well as the absence of civil society participation in ocean affairs discussions

encouraged building the literacy of multiple audiences (governments/politicians, youth, developers, etc.).

Annex 3: List of Submissions to Decade Scientific Objectives and Orientations

- Blue Carbon Initiative
- Centre for Blue Governance
- Centre for Environment fisheries and Aquaculture Science (CEFAS)
- Comité national français pour la COI (CN-COI)
- Convention on Biological Diversity (CBD)
- Coral Reefs High Seas Coalition
- Deep Ocean Observing Strategy (DOOS)
- Deep Ocean Stewardship Initiative (DOSI)
- Division for Ocean Affairs and the Law of the Sea (DOALOS)
- European Commission / Director-General for Research and Innovation
- European Commission / Maritime Affairs and Fisheries
- European Marine Board (EMB)
- European Space Agency (ESA)
- Galapagos Education and Research Alliance / University of Pennsylvania
- Global Environment Facility (GEF)
- Global Ocean Acidification Observing Network (GOA-ON)
- Global Ocean Observing System (GOOS)
- Global Ocean Oxygen Network (GO2NE)
- Group on Earth Observations (GEO)
- Integrated Biosphere Research Project (IMBeR)
- International Council for the Exploration of the Sea (ICES)
- International Group for Marine Ecological Time Series (IGMETS)
- International Hydrographic Organization (IHO)
- International Maritime Organisation (IMO)
- International Science Council (ISC)
- International Seabed Authority (ISA)
- International Union for Conservation of Nature (IUCN)
- IOC Chair WESTPAC
- IOC working group TrendsPO
- Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)
- Marine Alliance for Science and Technology for Scotland (MASTS)
- Marine Biological Association (MBA)
- Marine Technology Society (MTS)
- Mercator Ocean International
- Meteorological, Climatological and Geophysical Agency (BMKG) Indonesia
- MTS Journal
- National Oceanography Centre, UK
- Newcastle University
- Nippon Foundation / Ocean Nexus Program
- Ocean Decade Heritage Network

- Ocean Knowledge Action Network (Ocean KAN)
- Organisation for Economic Co-operation and Development (OECD)
- Partnership for Observation of the Global Oceans (POGO)
- Plymouth Marine Laboratory (PML)
- Save Our Mangroves Now (SOMN)
- Scientific Committee on Oceanic Research (SCOR)
- Surface Ocean - Lower Atmosphere Study (SOLAS)
- The International Association for the Physical Sciences of the Oceans (IAPSO)
- UN Environment Programme (UNEP)
- Western Indian Ocean Marine Science Association (WIOMSA)
- World Ocean Assessment (WOA-II)

Annex 4: Engagement of Key Stakeholder Groups

This section discusses key stakeholder groups that are essential partners to the success of the Decade. Three high-level goals will drive the engagement process of these groups throughout the Decade as shown below.

The discussion below focuses on the role that each of these groups could play in the Decade, and describes specific processes to engage them in the Decade that build on the overall goals identified above and the stakeholder engagement mechanisms identified in Section 2.5 of the Implementation Plan.

Ocean Science and Knowledge Generators

Scientists: Major benefits to the scientific community from participation in the Decade will include increased opportunities for partnerships - including with across disciplines and with non-scientific ocean actors, increased opportunities for financing or in-kind support, increased strengthening of the science-policy interface via improved uptake of science into policy, and increased visibility and recognition of the role of ocean science as a fundamental contributor to sustainable development and human wellbeing. Contributions of scientists will be the central element of knowledge generation throughout the Decade. The scientific community will also have a role to play in communicating and advocating for the Decade. To date, awareness and engagement of the ocean science community in the Decade has been very strong. Ocean scientists have been the most represented group in global and regional consultative meetings ensuring excellent geographic diversity in scientific debate around the Decade. There is a robust existing framework for Decade engagement with scientists via forums, events, networks and highly visible Decade 'champions' within the scientific community, including the members of the Decade EPG. This framework will continue to be used and built upon throughout Decade implementation. Challenges remain in engaging scientists outside the traditional ocean science disciplines for example, social scientists, political economy or governance scientists, or sustainability scientists, and these groups will be targets of future engagement.

Local and Indigenous Knowledge Holders: Engagement of local and indigenous knowledge holders in the Decade can provide access to new information that is locally specific, often of a long time series, and in areas where there is less scientific research data available; improve understanding of cross-scale

interactions and ecosystem dynamics through the combination of local and indigenous knowledge and scientific knowledge; and provide new understanding about human interaction with natural systems. The benefits that could accrue to local and indigenous knowledge holders from participation in the Decade include gaining access to new data that can enhance understanding of surroundings including connection to broader geographical areas and/or projections of data into the future that may assist with management decisions; collaboration with scientists that may help traditional knowledge evolve, innovate and adapt to ecological change; and serving as a catalyst for communities to collect and document information in innovative or accessible formats that can aid in its preservation. Incorporation of indigenous and local knowledge is a guiding principle of the Decade and Actions seeking endorsement under the Decade will be required to demonstrate how they have considered these issues and how indigenous and local knowledge holders are engaged in Decade Actions. The Implementation Plan includes a strategic orientation related to the development of mechanisms to integrate traditional, experiential and local knowledge into ocean observation, monitoring and assessment systems. Finally, the governance framework for the Decade requires geographic diversity to be taken into account - including from LDCs and SIDS - in the establishment of Decade governance structures.

Early Career Ocean Professionals

Early Career Ocean Professionals (ECOPs) can make crucial contributions to the Decade by actively participating in programs, bringing expertise, building lasting collaborations, forging innovative approaches, leading new initiatives, acting as Decade 'Ambassadors', and continuing the Decade's legacy post-2030. ECOPs will benefit from professional development opportunities and participation in international, interdisciplinary and multi-sectoral collaborations that arise through the Decade. To ensure strong engagement by ECOPs throughout the Decade, criteria related to generational diversity have been included in the governance framework and in the endorsement process for Decade Actions. In addition, an Informal Working Group (IWG) for ECOPs has been established to: (i) identify the key needs, interests and potential contributions of ECOPs to the Decade; (ii) engage ECOPs in the Decade preparation phase; and (iii) incorporate ECOP contributions to the development of the Decade Implementation Plan.

As part of the Decade preparation phase the IWG for ECOPs undertook a global survey of over 1000 ECOPs to identify the potential broad categories of engagement with the Decade. Five areas of engagement were identified and the IWG will work to refine these initiatives and establish partnerships for their implementation in coming months.

- **Training:** Training ECOPs in the acquisition and application of ocean science for sustainable development outcomes could be a critical capacity development focus under the Decade. The development of ocean training programs could include: (i) mentorship programs and two-way peer-to-peer exchange; (ii) open-access training courses related to the translation of science for sustainable development; (iii) special sessions or other opportunities for ECOPs to meet senior ocean professionals, including from different stakeholder groups, at Decade conferences and workshops; and (iv) global leadership program for linking science to policy and practice.
- **Networking:** Networks enable knowledge sharing, development and adoption of best practices in interdisciplinary and inter-sectoral initiatives, capacity and professional development, leadership training, building of relationships across geographical and disciplinary boundaries, and interaction between multiple stakeholder groups. A Decade ECOP Network could be established to connect existing early career networks, increase the engagement of ECOPs in Decade activities and enable the exchange of knowledge and ideas for research, policy, communication and capacity building

that can expand and develop beyond the Decade. Regional nodes connected to a centralised hub for such a network could support targeted and inclusive engagement and better enable ECOPs in developing countries to contribute to and benefit from Decade activities.

- **Information Sharing:** Online platforms to exchange information regarding training, professional development, events announcements, career opportunities, technology transfer, funding and collaboration opportunities will be key to enabling ECOP engagement in the Decade. A data portal addressing ECOP interests could serve as a central hub for such information and enable ECOPs to enhance their visibility to potential collaborators and support matchmaking of ECOPs to other partners. It could also provide a space for networking, discussion, development and sharing of community guidelines, and access to data and other knowledge exchange opportunities provided through the Decade.
- **Funding:** Funding opportunities will be critical to support ECOPs, especially from developing countries, in contributing to and benefiting from the Decade, including for: training, publications, projects, scholarships, travel support, paid internships, membership fees for professional societies, and interdisciplinary and multi-sectoral collaborations.

Ocean & Sustainable Development Policy Makers - UN Agencies & National Governments

UN Agencies: UN Oceans is an inter-agency mechanism that seeks to enhance the coordination, coherence and effectiveness of organizations working on ocean related issues. Comprising over 30 members, UN Oceans provides a platform for exchange and coordination across the UN system[13]. The UN Oceans Contact Group for the Decade has played a central role in the preparation phase by providing inputs to the Implementation Plan and ensuring coherency of Decade planning with other UN initiatives. This group will continue to act as a platform for discussion and exchange throughout Decade implementation.

UN partners carry out a wide range of ocean science initiatives that align closely with Decade priorities and thus will be proponents of Decade Actions - including training and education, data management, and research to inform their respective mandates that include coastal zone management, fisheries, marine protected areas, blue economy, support to SIDS, or climate action amongst others. Many also have a need for improved access to, and coordination of, ocean science, data and information, partnerships, and supporting infrastructure to inform the implementation of their respective programmes.

UN agencies will play a role in the formal governance of the Decade. UN DOALOS as the Secretariat of UN Oceans and other UN agencies will be represented on the Decade Board. The Decade Coordination Unit - which will be the central coordination body for the Decade - will work in close collaboration with the Secretariat of other UN bodies and will ideally include seconded staff from UN agencies and programmes to ensure a well-coordinated inter-agency approach. For certain coordination functions, a more decentralized approach may be explored by appointing personnel within UN Body Secretariats to support different coordinating functions of the Decade.

[13] Members include CBD, CTED, ESCAP, FAO, IAEA, ILO, IMO, IOC, ISA, DESA, DOALOS, ODA, OHRLLS, UNCTAD, UNDP, UNEP, UNESCO, UNHCR, UNIDO, UNITAR, UNU, UNWTO, WMO, World Bank http://www.unoceans.org/

Finally, it is expected that some UN agencies will join the Ocean Decade Alliance as a means of making commitments to the Decade and participating in promotion of the Decade vision at the highest international levels.

National Governments: National governments are the primary source of funding for ocean science, yet recent analyses indicate that SDG14 is ranked as a lower priority than many other SDGs by leaders in both developed and developing countries[14], and the proportion of national research budgets that is dedicated to ocean science remains extremely low. Enhancing ocean literacy of national governments to increase understanding of the role that SDG14 and thus ocean science plays in reaching the 2030 Agenda may increase support for investment. The development and wide dissemination of scientific knowledge, applications and tools that are highly relevant and useful to national governments will also facilitate increased investment in ocean science: This underscores the importance of engaging end-users in the co-design of ocean science that will be implemented throughout the Decade. National governments are challenged on an ongoing basis to find solutions to ocean sustainability issues and to create the enabling conditions for a healthy economy. The Decade, through the communications strategy and ocean literacy initiatives, will increase the awareness of national government decision makers in relation to the importance of ocean science to achieving the SDGs. It will develop clearer paths for involvement of end-users including national governments in the definition of priority scientific questions and the co-design of contributions to the Decade. It will also develop capacity and equip national governments with the knowledge, tools, and solutions to inform assessment of policy options and the decision making process. The Decade will also provide a space for developing transformative public-private partnerships. The primary mechanism for engaging national governments in the Decade will be through the Member States of the IOC and of the United Nations, as well as relevant constituencies of other UN bodies. Via existing processes, Member States will be informed of all opportunities to participate in the Decade and be kept informed of progress. In addition, governments will be encouraged to take a lead role in National Decade Coordination Committees.

Business & Industry

The private sector is the primary commercial user of the ocean with many businesses such as fisheries, aquaculture, shipping, submarine cables, port activities, offshore wind farms, offshore oil and gas, maritime manufacturing and construction, and tourism. New sectors are also emerging such as deep and ultra-deep water seabed mining, renewable energy, maritime safety and surveillance, and marine biotechnology. All of these industries depend on access to marine space and resources and most are dependent on thriving and diverse ocean ecosystems for their economic wellbeing. Given the significance of reliable data and information to support economic activities, the private sector can contribute to the Decade by providing in-kind support to Decade Actions - including sharing of datasets, or developing and deploying new and emerging technology to facilitate ocean science such as, artificial intelligence and machine learning for data collection, management, analysis and application. Through investment in ocean science and technology and by leveraging the growing ocean innovation ecosystem including innovator networks, accelerator networks, marine clusters, the private sector is also well placed to develop and accelerate implementation of solutions in response to society's increasing demands for concrete actions related to sustainable development and sound accountability. Through engagement in the Decade, the private sector will benefit from enhanced scientific knowledge of the ocean based on coherent and comprehensive data, and information; improved insights into the business environment including policies, governance, and regulatory

[14] Custer, S., DiLorenzo, M., Masaki, T., Sethi, T., and A. Harutyunyan. (2018). Listening to Leaders 2018: Is development cooperation tuned-in or tone-deaf?. Williamsburg, VA: AidData at the College of William & Mary http://docs.aiddata.org/ad4/pdfs/Listening_To_Leaders_2018.pdf

process that impact and guide their operations; access to tools and information required to find solutions to ocean sustainability and secure investments in the blue economy; and opportunities to forge new public-private partnerships in ocean research. These benefits will reduce business risks associated with the changing ocean, and empower businesses to explore new markets and to improve their business models to enhance their long-term viability.

To maximize engagement efforts and reach, the Decade will actively engage with different business platforms and communities. A strong relationship has been developed with UN Global Compact - a voluntary initiative regrouping over 9000 private sector entities who are committed to the achievement of the SDGs, and more specifically with the Sustainable Ocean Business Action Platform. The Decade will also work with other business platforms and marine-related professional bodies to explore opportunities to stimulate innovative and transformative contributions to the Decade. It is anticipated that certain private sector entities will engage in the Decade as members of the Ocean Decade Alliance that would allow matchmaking between private sector partners and other ocean actors.

Philanthropic Foundations

The philanthropic community is a key player in mobilizing innovative and transformative science for a sustainable ocean. Other ocean actors will not be able to address the priorities of the Decade without the engagement of, and funding from, philanthropy. Developing an enabling environment that mobilizes partnerships in priority areas where action is urgently needed is central for the success of the Decade. Philanthropic foundations will be engaged throughout the Decade to share their vision and approach on how to stimulate a funding environment for the Decade and its priorities, how to raise awareness, contribute ideas, build synergies and promote strategies - including communications and outreach - to make ocean science more relevant. During the preparation phase, a dialogue was initiated with philanthropic foundations engaged in ocean science to better understand the interests and visions of foundations in supporting the objectives of the Decade. Participating foundations agreed to continue such dialogue meetings regularly throughout the Decade. This dialogue across science, funding mechanisms and society is crucial to identify and scale up effective partnership models, coordinate innovative approaches leading to increased uptake of science and technologies, through the global umbrella that the Decade provides.

NGOs & Civil Society

There are a large number of NGOs working in the ocean space and they vary significantly in terms of their scale (i.e. global, national, local), location, and mission. This diversity means that NGOs can potentially play a diverse range of roles during the Decade including

- Providers of ocean and marine data and research often over long time series in areas where there are limited datasets
- End-users of scientific data for management, conservation, disaster risk reduction etc.
- Breeding grounds for local marine scientists, particularly in SIDS and LDCs where ocean science career options are limited
- Links to, and influencers of, private and philanthropic funders supporting ocean and marine science
- Brokers of indigenous and traditional knowledge on ocean and marine science
- Bridges to youth and the next generation of ocean scientists
- Leaders of public information and awareness campaigns

- Pathways to national and sub-national government authorities, including integration of science in decision-making

The benefits that the Decade could generate for NGOs are also numerous. The ability to increase the scale and scope of their mission driven activities and the related possibility to attract new funding (especially sustainable, large-scale funding) are key motivations for NGOs to engage in the Decade. However, many NGOs, particularly smaller NGOs based outside the US and Europe, are somewhat disconnected from the UN system. While the Decade offers a unique opportunity to counter some of these preconceived notions and build stronger relationships, these perceptions also need to be recognized and appropriate strategies built to overcome them. The possibility for NGOs to contribute to a global effort for ocean science and sustainable development by aligning programmes and projects with the Decade priorities and seeking endorsement for actions that will allow them to build new partnerships, including with funders, will be highlighted in communications with this stakeholder group. NGOs will be key participants in discussions around data end-use, including data management and accessibility and in discussions around capacity development and ocean literacy. Opportunities to align Decade communication and outreach campaigns with campaigns run by NGOs will also be actively pursued. Decade initiatives such as Calls for Actions will be disseminated through NGO platforms and forums and NGOs will be supported to establish and/or participate in Decade Stakeholder Groups and will be important participants in the Global Stakeholder Forum.

Public

Youth

Youth, which in this context does not encompass ECOPs that are discussed separately, have a strong potential to contribute to the Decade. Youth are the next generation of ocean users, ocean scientists and ocean policy makers. In addition, as recent climate action initiatives have shown, youth are also increasingly powerful influencers of public opinion. The benefits that youth could obtain from the Decade include mentorship and support to undertake ocean related careers and increased knowledge and awareness of the role of the ocean in sustainable development including links to human wellbeing, climate action and other issues of interest to youth activists. Specific events, initiatives and communications campaigns will be targeted at youth throughout the Decade. This will include a strong focus on generating excitement about the ocean as an unexplored frontier including via Ocean Literacy activities in schools and other fora. Section 2.4 contains additional detail on the proposed approach to Ocean Literacy throughout the Decade.

General Public

The general public has potential to contribute to the Decade via initiatives related to citizen science and crowdfunding that could contribute directly to the achievement of the Decade objectives. Communities worldwide will benefit directly through improved management of coastal resources, reduction of hazards and enhanced livelihoods, as well as increased knowledge and understanding of the role that the ocean plays in underpinning a sustainable society. The Decade communications strategy includes a range of actions to target the general public.

Annex 5:Proposed Terms of Reference for Decade Board

Board of the UN Decade of Ocean Science for Sustainable Development

Terms of Reference

The Board of the UN Decade of Ocean Science for Sustainable Development (the Board) is established as an advisory body of the governing bodies of the Intergovernmental Oceanographic Commission (IOC) of UNESCO. It operates in accordance with the rules of procedures for IOC advisory bodies.

Role of the Board

The Board is responsible for the high-level, strategic oversight of the UN Decade of Ocean Science for Sustainable Development ('the Decade') over its ten-year implementation phase (2021 – 2030) and will lead the process to set the strategic agenda and review the performance of Actions endorsed under the Decade. Specifically, and in accordance with the Implementation Plan of the UN Decade of Ocean Science for Sustainable Development, the Board will:

- Undertake regular review processes during the implementation phase including review of the scientific objectives and orientations of the Implementation Plan, annual progress reports, and the mid-term and final reviews.
- Define and recommend strategies for resource mobilisation to support Decade implementation.
- Organise regular Calls for Action under the Decade
- Review and approve the endorsement of programmes under the Decade.
- Review and approve the endorsement of Decade Collaborative Centres established under the Decade.
- Promote and raise awareness of the Decade and catalyse high-level interest and engagement in the Decade.
- Report to the IOC governing bodies, as well as facilitate the information required for the Secretary-General to report progress to the UN General Assembly.

Chair of the Board

The Chair of the IOC will be the Chair of the Board. The Board will elect a vice-chair.

Membership of the Board & Appointment Process

The Board will comprise up to 20 members. Members will be nominated through open calls for nominations. The calls will be circulated through the following means:

- IOC Member States via Circular Letter;
- relevant UN bodies via UN-Oceans;
- scientific networks using formal and informal communication mechanisms; and
- dedicated ocean policy, business, and sustainable development networks through announcements.

Members will be selected with due consideration to expertise, geographic, generational, and gender balance and will serve in their personal capacities. Membership will be on a rotational basis with members to serve two-year (renewable) terms.

UN DOALOS (as the Secretariat and focal point of UN-Oceans) will be represented on the Decade Board. Three (3) other seats will be reserved for UN agencies on the Decade Board with agencies to be nominated through UN Oceans.

A Selection Panel (with the technical support of the Decade Coordination Unit), convened by the IOC Chair and composed of the IOC elected Officers, will be tasked with selecting the remaining members of the Board.

The Selection Panel will ensure that the proposed members have sufficient skills, knowledge, authority and influence regarding the vision and objectives of the Decade and are able to undertake the work outlined in the terms of reference. Their skills and expertise should cover:

(i) Intergovernmental processes and coordination;

(ii) The ocean aspects of sustainable development;

(iii) Ocean science (natural/social dimension);

(iv) Science-policy / decision / end-user interface;

(v) Capacity development, training and transfer or marine technology, education, communication and outreach;

(vi) Development of large-scale international programmes / projects.

Secretariat of the Decade Board

The Decade Coordination Unit will be the Secretariat for the Board.