Engaging and Empowering Regional Stakeholders

Synthesis of Regional Consultation Workshops (Preparation Phase 2019–2020)

The United Nations
Decade of Ocean Science
for Sustainable Development
(2021–2030)

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Contents

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List of acronyms

AI	Artificial intelligence
CHM	Clearing House Mechanism
EC	European Commission
eDNA	Environmental DNA
EEZ	Exclusive economic zone
EIA	Environmental Impact Assessment
FAIR data	Data which meet principles of findability, accessibility, interoperability, and reusability
GOOS	Global Ocean Observing System
IKS	Indigenous knowledge system
IOCINDIO	IOC Regional Committee for the Central Indian Ocean
IOC-UNESCO	Intergovernmental Oceanographic Commission of UNESCO
IOOS	Integrated Ocean Observing System
IUU	Illegal, unreported and unregulated (fishing)
LDC	Least Developed Countries
LLDC	Landlocked Developing Countries
LME	Large Marine Ecosystem
MPA	Marine Protected Area
NGO	Non-governmental organization
OOS	Ocean Observing System
SEA	Strategic environmental assessment
SIDS	Small Island Developing States
SMART	Specific, Measurable, Achievable, Realistic, Time-bound
SOOS	Southern Ocean Observing System
TK	Traditional knowledge
TMT	Transfer of marine technology
UNEP	United Nations Environment Programme
UNEP-MAP	United Nations Environment Programme Mediterranean Action Plan
UNGA	United Nations General Assembly
WTA	Western Tropical Atlantic

Acknowledgements

Between June 2019 and May 2020, global, thematic and regional consultation workshops convened over 1,500 participants from the scientific community, governments, UN entities, NGOs, private sector and donors across ten ocean basins. These workshops 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. Invaluable support was provided for the organization of these workshops by the governments of Brazil, Canada, Denmark, India, Italy, Japan, Kenya, Netherlands, Norway, Sweden, Republic of Korea and Mexico, as well as the secretariats of the UN Environment Programme (Nairobi Convention, Mediterranean Action Plan (UNEP/MAP), Cartagena Convention, Caribbean Environment Programme), the United Nations Development Programme (UNDP), the Global Environment Facility (GEF), the European Commission, the Ocean Frontier Institute (Canada), the North Pacific Marine Science Organization (PICES), the Italian Oceanographic Commission, the National Institute of Ocean Technology (NIOT) and the National Center for Coastal Research (NCCR) of India, the International Council for the Exploration of the Sea (ICES), the Permanent Commission for the South Pacific (CPPS), the Mediterranean Science Commission (CIESM), the BlueMed Initiative, the Danish Centre for Marine Research, the Universidad Nacional Autónoma de México (UNAM), the Old Dominion University, Universidade Federal de São Paulo (UNIFESP), the Research Council of Norway, Arctic Frontiers, the Scientific Committee on Antarctic Research (SCAR), SCAR Antarctic Biodiversity Portal, the Royal Netherlands Institute for Sea Research (NIOZ), the Scientific Committee on Ocean Research (SCOR), the Kenya Marine and Fisheries Research Institute (KMFRI), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), the Pacific Community (SPC), the Western Indian Ocean Science Association (WIOMSA), Coastal Oceans Research and Development – Indian Ocean (CORDIO) East Africa, the All-Atlantic Ocean Research Alliance, Praticagem do Brasil (CONAPRA), the Southern Ocean Observing System (SOOS) and the Fundação Grupo Boticário.

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Introduction

The United Nations Decade of Ocean Science for Sustainable Development 2021–2030 (hereafter the 'Ocean Decade') offers the ocean community a unique opportunity to join efforts, mobilize resources, create partnerships and engage governments in moving towards 'the science we need for the ocean we want'.

The Ocean Decade Implementation Plan[1] provides the strategic framework for the implementation of the Decade. It has been developed through a highly participatory and inclusive process (see Figure 1). Regional consultation workshops have been an essential mechanism throughout the preparation phase (2018–2020) to engage regional and local ocean stakeholders in the Decade's design. This report has been prepared to provide a synthesis of the main outcomes of the regional consultation process. It is composed of three sections:

Part 1 describes how the consultative and planning process of the preparatory phase was organized to inform and engage national and regional stakeholders across ten ocean basins, and presents a series of important common messages that emerged from the diverse workshops.

Part 2 presents a synthesis of the outcomes of the regional consultation workshops, by providing a snapshot of the main scientific and capacity-building needs and cross-cutting priorities that were identified for each region, as well as providing examples of inspirational initiatives that could be transformed into future Decade Actions.

Part 3 provides guidance to stakeholders on how to engage at national and regional levels with the Ocean Decade, and outlines the next steps in preparing regional action plans and Decade Actions.

1 https://www.oceandecade.org/resource/108/Version-20-of-the-Ocean-Decade-Implementation-Plan-

Part 1. The preparatory phase

1.1 The role of regional consultation workshops in the Decade design process

At the start of the preparatory phase in June 2018, the Ocean Decade Roadmap[2] offered a preliminary set of globally defined objectives and research and development priority areas, aimed at guiding the development of activities and new programmes. The roadmap also defined a bottom-up process, to allow for the regional or local definition of these outcomes and objectives. From the outset of the preparation phase, regional consultation workshops were envisaged as an integral part of the Decade design process (Figure 1).

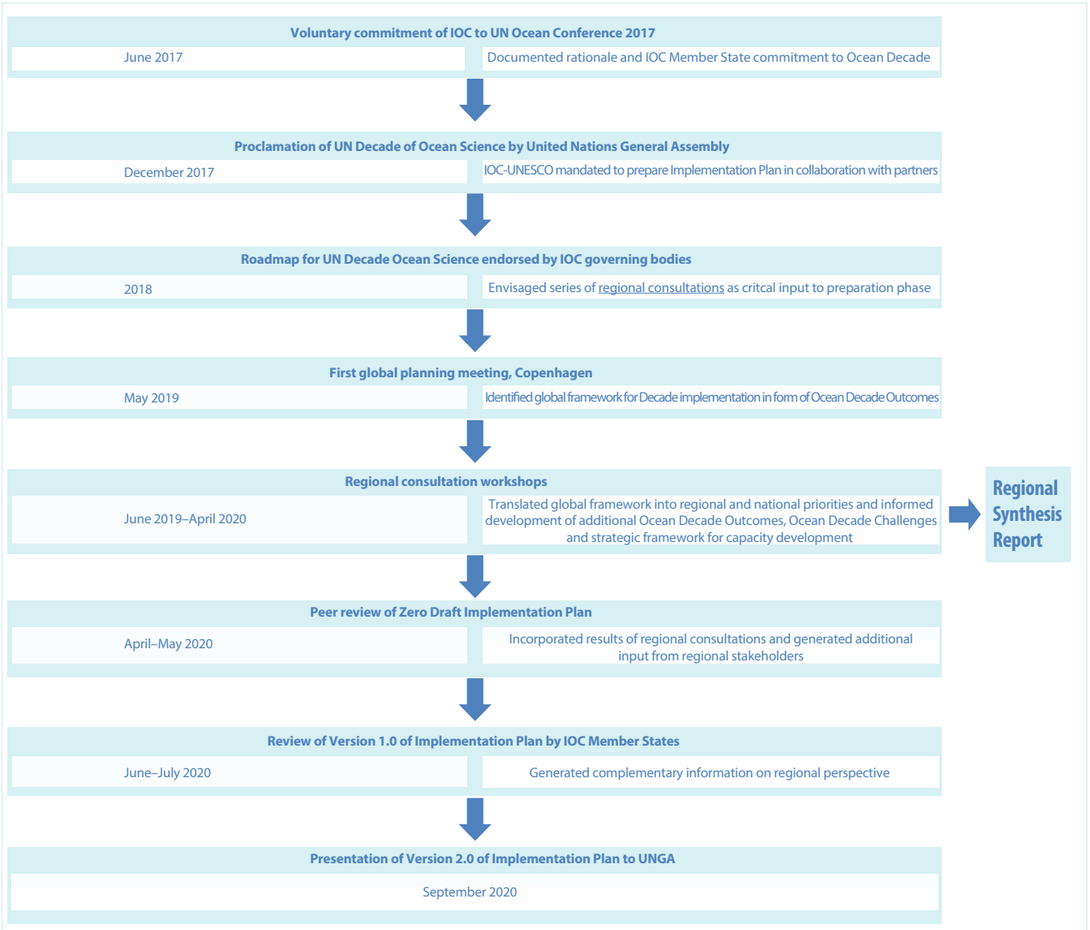

Figure 1. Preparation of the Implementation Plan for the Ocean Decade. *Source*: IOC-UNESCO

2 https://www.oceandecade.org/resource/44/REVISED-ROADMAP-FOR-THE-UN-DECADE--OF-OCEAN-SCIENCE-FOR-SUSTAINABLE-DEVELOPMENT----- 'Engage, consult relevant communities and communicate about the Decade', Section 3.3 IOC/EC-LI/2 Annex 3, Fifty-first Session of the Executive Council, UNESCO, Paris, 3–6 July 2018.

1.2 Description of the regional consultation workshops

The regional consultation workshops offered a crucial opportunity to co-design solution-oriented research strategies for the Ocean Decade in line with the 2030 Agenda and regional strategies and commitments. The workshops focused on specific needs and priorities in terms of transforming knowledge systems, accelerating the transfer of marine technology (TMT), enabling capacity development and education, fostering science-policy dialogues and promoting effective communication for the Decade.

With the support of IOC-UNESCO Member States and partners, a total of 11 regional consultation workshops were held (see Figure 2). Over 1,900 expert participants from 109 different countries took part in the workshops, many of which were also live-streamed online to reach a wider audience. Around 40% of the participants in the workshops came from the ocean science and technology communities, while the remaining representatives came from UN entities, the ocean and sustainable development policy sector, NGOs and civil society, philanthropic organizations, and business and industry. Analysis of participants indicated that approximately 60% were male and 40% were female; however, gender parity was ensured for all panels and working group moderators.

Figure 2. Map of regional consultation workshops. *Source*: IOC-UNESCO

The governments of Brazil, Canada, Denmark, India, Italy, Japan, Kenya, Netherlands, Norway, Sweden, Republic of Korea and Mexico.

(i) The South Pacific, Noumea, New Caledonia, 23–25 July 2019: the Pacific Community (SPC)
(ii) The North Pacific, Tokyo, Japan, 31 July–2 August 2019: the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), the North Pacific Marine Science Organization (PICES)
(iii) The Southeast Pacific, Guayaquil, Ecuador, 24–26 September 2019: the Permanent Commission for the South Pacific (CPPS)
(iv) The South Atlantic, Rio, Brazil, 25–27 November 2019: Fundação Grupo Boticário, Praticagem do Brasil (CONAPRA), the All-Atlantic Ocean Research Alliance, Universidade Federal de São Paulo (UNIFESP), the European Commission
(v) The North Atlantic, Halifax, Canada, 6–10 January 2020: the Ocean Frontier Institute (Canada)
(vi) The Indian Ocean and marginal seas, Chennai, India, 8–10 January 2020: the National Institute of Ocean Technology (NIOT) and the National Center for Coastal Research (NCCR) of India
(vii) The Mediterranean Sea, Venice, Italy, 21–23 January 2020: the International Council for the Exploration of the Sea (ICES), the Mediterranean Science Commission (CIESM), the BlueMed Initiative, the Italian Oceanographic Commission, the European Commission, Mediterranean Action Plan (UNEP/MAP)
(viii) Africa and the Adjacent Island States, Nairobi, Kenya, 27–29 January 2020: the Western Indian Ocean Science Association (WIOMSA), Coastal Oceans Research and Development – Indian Ocean (CORDIO) East Africa, the Scientific Committee on Ocean Research (SCOR), the Kenya Marine and Fisheries Research Institute (KMFRI), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Secretariats of the UN Environment Programme (Nairobi Convention), the United Nations Development Programme (UNDP), the Global Environment Facility (GEF)
(ix) The Arctic Ocean, Tromsø, Norway, 29 January 2020: the Research Council of Norway, Arctic Frontiers
(x) The Southern Ocean, San Diego, USA, 16 February 2020: the Southern Ocean Observing System (SOOS), the OLD Dominium University, the Scientific Committee on Antarctic Research (SCAR), SCAR Antarctic Biodiversity Portal, the Royal Netherlands Institute for Sea Research (NIOZ)
(xi) The Western Tropical Atlantic, held virtually in Merida, Mexico, 28–29 April 2020: the Universidad Nacional Autónoma de México, the Secretariats of the UN Environment Programme (Cartagena Convention, Caribbean Environment Programme)

The regional consultation workshops followed a relatively standard structure in order to deliver a number of comparable outputs to inform the design process and feed into the development of the Implementation Plan. Working groups were organized around the Decade Outcomes and expert panels addressed cross-cutting issues such as capacity building and TMT, partnerships and funding, traditional knowledge and effective communication for the Decade.

1.3 Common messages emerging from the regional consultation workshops

Enriched by the diversity of geographies and participants, the regional consultation workshops delivered a series of clear, common messages on a broad range of themes.

It was agreed that the current state of the ocean requires urgent action, and although we have enough knowledge about many elements of the ocean to act, institutional changes tend to be slow. There was strong consensus that we need to change the human mindset – especially that of decision-makers – to act quickly, based on existing knowledge and capacities. Other ocean-related issues lack critical knowledge, for example, the deep ocean, marine biodiversity, land-sea and climate-ocean interactions, or the effects of climate change on ecosystems. Regions should use the Decade as an opportunity to develop alliances and networks to rectify disparities in knowledge in these areas across ocean basins.

Data collection and availability for all was seen as one of the top priorities of the Decade and it is vital that by 2030 we have an improved infrastructure for data handling and sharing. Observational and modelling capacity should be enhanced and expanded, and uncertainties in regional climate models reduced. Fact-based good governance and an effective organizational framework will be essential in this regard.

It was agreed that in order to promote inclusive human and socio-economic growth, preserve livelihoods and strengthen communities' resilience, scientists must work with private sector donors, policymakers and civil society. Youth was identified as a vital component of future success in this area, and the Decade should become a platform for the improved engagement of young scientists and early career professionals, who should be encouraged to develop new ways of ensuring sustainability of the ocean economy, particularly through the use of new technologies.

The Ocean Decade should use its influence to ensure gender equality across every discipline and sector if we are to see improvements in all of the above areas.

Box 1. Ocean Decade Challenges:

The ten Ocean Decade Challenges represent the most immediate and pressing needs of the Decade and aim to convene diverse actors around collective action. The Challenges, which are listed below, were directly influenced by the scientific priorities discussed in the regional consultation workshops:

1. Understand and beat marine pollution
2. Protect and restore ecosystems and biodiversity
3. Sustainably feed the global population
4. Develop a sustainable and equitable ocean economy
5. Unlock ocean-based solutions to climate change
6. Increase community resilience to ocean hazards
7. Expand the Global Ocean Observing System
8. Create a digital representation of the ocean
9. Deliver data, knowledge and technology to all
10. Change humanity's relationship with the ocean

Box 2. Principles for Capacity Development during the Ocean Decade:

Capacity development was identified as a priority need throughout all the regional consultation workshops. Based on discussions in the workshops, the following capacity development principles were elaborated and included in the Ocean Decade Implementation Plan:

- Be an integral part of each Decade Action. In this sense, the endorsement criteria of the Decade include a consideration of contributions towards capacity development, including in SIDS, LDCs and LLDCs.
- Be needs driven with investment in tools that can match the demand for capacity development to different opportunities.
- Optimize opportunities for exchange of knowledge, information and learning through the adoption of a capacity development exchange approach, where relevant.
- Be developed to respond to regional and national priorities including, where relevant, through the use of capacity needs assessments for specific groups or geographies.
- Respect cultural and geographical diversity, for example in terms of language, technology adopted, including digital technologies and remote learning, and methods of learning.
- Privilege long-term partnerships that build on existing resources and networks, 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 well-being.
- Target both knowledge generators and knowledge users including scientists, industry, managers (for example, protected area or fisheries managers), policymakers, decision makers, innovators and society.
- Address all facets of ocean science, i.e. all relevant natural and social science disciplines, including a focus on inter- and transdisciplinary approaches, the infrastructure and technology that supports ocean science, the application of science for societal benefit, and the science-policy and science-innovation interfaces.
- Recognize, respect and engage local and indigenous knowledge holders as both beneficiaries and providers of capacity development.
- Build on and strengthen existing national and regional networks and resources.
- Identify and overcome barriers to gender, geographical and generational balance and mainstream accessibility to foster a full and effective participation by persons with disabilities.

A strategic framework for capacity development was also developed as part of the Implementation Plan and identifies the different types of capacity development that will be carried out over the duration of the Ocean Decade.

Part 2. Outcomes of the regional consultation workshops

The discussions and outputs of each regional consultation workshop were used to shape the Decade Action Framework contained in the Implementation Plan and will help to set future regional priorities for Decade Actions (Figure 3).

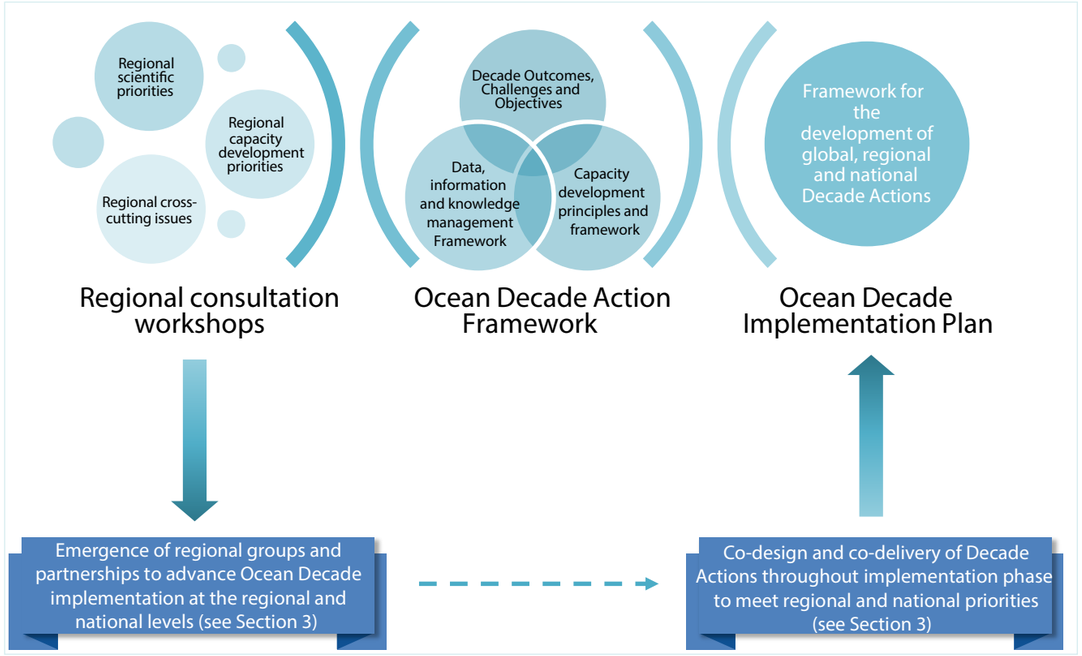

Figure 3. Role of regional consultation workshops in Ocean Decade implementation. *Source*: IOC-UNESCO

The following section provides a snapshot of the outcomes of the regional consultation workshops in terms of the key scientific and capacity development priorities that were discussed. The issues identified below are not exhaustive. They do not represent the only priorities for each region to address during the Ocean Decade. Rather, they aim to provide an overview of the discussions held by the diverse participants in the workshops as a basis for future dialogue around the development of regional priorities.

The level of detail presented in the following tables differs across regions – this is not indicative of the importance of each region, nor of the richness of discussions in the workshop, but rather it reflects the structure of the workshops, such as the number of participants or the methods of moderation used in the working groups. Each table contains a link to the detailed workshop report.

ARCTIC OCEAN	Tromsø, Norway, 29 January 2020	No. of participants : Approx. 100	Weblink to workshop report

Regional scientific priorities

A clean ocean

- Understand consequences of remobilization of contaminants, and synergistic and cumulative effects of multiple contaminants.
- Understand distribution and effects of micro- and macroplastics.
- Understand anthropogenic underwater noise.
- Understand the combined effects of climate change and other anthropogenic stressors, along with the spreading of pollutants.

A healthy and resilient ocean

- Understand diverse Arctic ecosystems for which there are significant differences in knowledge between ecosystem types and across geographies; this could include a focus on the 18 Large Marine Ecosystems (LMEs) of the Arctic.
- Establish baselines for diverse Arctic ecosystems as a means of understanding their resilience and adaptive capacity.
- Increase knowledge of land-ocean interactions, including increased understanding of measures to mitigate impact of freshwater fluxes and coastal erosion.
- Research and monitoring of the seabed and subsurface and mapping of the ocean floor within and outside national jurisdictions.

A productive ocean

- Increase understanding of existing and projected fish stocks and population dynamics, and better knowledge of the effects of changes to fisheries on indigenous communities that depend on the ocean and on ecosystems.
- Increase understanding of the impacts of commercial use (e.g. from ship traffic, seabed activity or fisheries) on ecosystems and ocean health.
- Increase understanding of the effects on human health of contaminants in seafood, with a focus on indigenous communities that depend on hunting and fishing.

A predicted ocean

- Reduce uncertainties in regional models, including climate models, and developing models that take account of the differences in the nature and rate of environmental change throughout the Arctic.
- Increase knowledge of the circulation of the Arctic Ocean with 3D modelling of the ocean interior.
- Increase in situ observations from the Arctic Ocean, particularly long-term ocean observations, so as to homogenize the level of knowledge across different parts of this diverse ocean basin. This includes filling knowledge gaps for the Siberian seas and the Central Arctic Ocean, which are less well understood than other parts of the ocean basin (e.g. Barents Sea and Fram Strait), and generating knowledge on the ocean-atmosphere and ocean-cryosphere interface, and the land-sea interface.

A safe ocean

- Increase understanding of ice dynamics under a changing climate.
- Increase understanding of the spatial and temporal effects of pollution, including oil spills, to inform effective responses.

An accessible ocean

- Data collection, storage and sharing, including regional data handling and sharing infrastructure to increase accessibility; this should engage industry as an important actor in data generation and use.
- Strengthen area-based management tools, including marine protected areas (MPAs).

An inspiring and engaging ocean

- Embrace indigenous and local knowledge in addition to instrumental observations.
- Initiate citizen science data activities to collect alternative sources of data and raise engagement among local communities.
- Increase knowledge on human behaviour and reaction to global change, for example in reaction to changes in distribution in fish stocks.
- Integration of cultural, historical and social values into models and projections, which allow decisions to be made with a knowledge of trade-offs and benefits.

Capacity development priorities

- Fellowships for youth and early career ocean professionals.
- Interdisciplinary research that integrates physical, natural and social science and embraces indigenous knowledge.
- Communication techniques for peer-to-peer exchange and learning.
- Increased formal and informal education and ocean literacy in schools.

Example future Decade Actions

- Pan-Arctic observations network, including autonomous samplers/instruments for in situ data collection that can help to fill gaps in knowledge in key areas, and mechanisms to embrace indigenous and local knowledge systems.
- Marine spatial planning to improve management of shipping traffic.
- Development of models to predict effects of oil spills or other pollution emergencies to inform coordinated and effective responses.
- Improved network of Arctic contaminant monitoring, including environmental specimen banks to detect time series of emerging contaminants.
- An Arctic data portal for storage, handling and sharing of data that engages and connects diverse generators and users of data and knowledge, including industry.
- Development of an Arctic Frontiers youth programme.

Relevant cross-cutting issues

- Rapid adaptive management will be critical given the pace and diversity of environmental change that is being observed in the Arctic. The Arctic Ocean needs fact-based good governance and an effective organizational framework. The Ocean Decade could help to convene dialogue around these institutional issues, and foster international cooperation, for example through science diplomacy.
- The Decade should also actively facilitate links between developers of information and knowledge products and the users of those products.
- Funding – and thus project implementation – is predominantly carried out at the national level, yet the issues facing the Arctic are regional. International or multi-country funding mechanisms are needed.

NORTH ATLANTIC	Halifax, Canada, 6–10 January 2020	No. of participants : Approx. 150	Weblink

Regional scientific priorities

A clean ocean

- Increase solutions-focused knowledge on CO2, chemical and nutrient pollutants, plastics, invasive species, noise and emerging pollutants and contaminants, including light and pharmaceutical pollution.
- Develop risk thresholds and risk assessment methods for understanding impacts on biota and human health under climate change and multiple stressors; this should include development of easily interpreted tools and meaningful metrics.
- Develop tools to quantify risks and benefits and evaluate trade-offs for different management actions to manage the effects of pollution.

A healthy and resilient ocean

- Increase understanding of global marine processes and the role of species, including in poorly understood environments such as the mesopelagic ecosystems and marine micro-organisms; information is needed on basic ecology, life history, connectivity, migration and food web linkages, as well as linkages to nutrient and carbon cycles.
- Increase understanding of ecosystem resilience and ecosystem regime shifts in order to develop relevant adaptation measures.
- Quantify socio-ecological trade-offs of human activities on ecosystems and methods to engage users in understanding and resolving trade-offs.
- Enhance knowledge of ecosystem changes associated with aquaculture operations.
- Improve understanding of multi-stressor/user environment (e.g. climate change, invasive species, etc.) with unknown cumulative effects on ecosystem function.

A productive ocean

- Link integrated ecosystem assessments to marine spatial planning to manage diverse and changing demands on the ocean.
- Improve the application of ecosystems-based fisheries approaches by developing integrated ecosystem assessments to inform fisheries management; this could include use of area-based management tools.
- Increase knowledge for sustainable fisheries and aquaculture practices, including socio-economic interactions and benefits.
- Develop new generation fisheries models to take account of rapid global change.
- Generate knowledge to develop sustainable or low-impact marine technologies related to biotechnology and genetic resources, minerals and deep-sea mining, new forms of renewable energy, transport and tourism.
- Better understanding of the role of the ocean in food security in the region.
- Better understanding of 'blue growth' and associated economic opportunities.
- Effective area-based management schemes, including marine spatial planning, environmental impact assessments (EIAs) and strategic environmental assessments (SEAs).

A predicted ocean

- Define goals for a North Atlantic Basin Scale Sustained Ocean Observing System to enhance observations in order to improve models for robust predictions, including risk assessment and uncertainty analysis. Address existing gaps in observations, including observations of physics to ecology to societal dimensions, geographic gaps (coastal areas, deep basin), and a lack of sustainable funding.
- Couple models across disciplines and domains, and encourage the use and communication of results. Create model inter-comparison activities.
- Develop the Atlantic Ocean 5D – an inclusive digital ecosystem, linking digital resources including social media streams and knowledge of local and indigenous communities; create a set of standards for data of all types and optimize machine-to-machine readability; recognize the CARE principles applying to indigenous sourced data and fully implement the FAIR principles.
- Improve climate models and marine-coastal weather forecasting.
- Understand ocean processes to improve models for robust predictions, including risk assessment and uncertainty analysis.

A safe ocean

- Reinforce efforts to conduct an integrated examination of existing and changing hazards and interlinked risks. Link specific hazards to risk and resilience concerns in order to guide mitigation strategies.
- Develop basin-wide, multi-scale understanding of hazard vulnerabilities, including increased knowledge of the effects of sea level rise and interactions with other ocean hazards.
- Develop a multi-hazard warning system that incorporates physical, biological and social data, as well as new technologies.
- Better understanding of risk associated with increased and changing ocean traffic.

An accessible ocean

- Reinforce ability to transform data into information, knowledge and linkages across data sets, and review and improve how these are communicated.
- Build an inclusive digital ecosystem linking digital resources, including social media streams, and the knowledge of local experts (e.g. fish harvesters) and indigenous communities.
- Use data and information stored in accessible data systems to visualize many aspects of the ocean, in order to support ocean literacy and education initiatives.
- Create, at a minimum, a set of standards (e.g. metadata) for data of all types that will also facilitate and optimize machine-to-machine readability.
- Promotion and sharing of best practices for ocean science methods.

An inspiring and engaging ocean

- Better understanding of the socio-economic values of the ocean, including the products and services that it provides.
- Support citizen participation models for participatory monitoring and mechanisms and allow feedback of scientific knowledge to local communities.
- Develop mechanisms to highlight the contribution of indigenous and local knowledge to all elements of the ocean science value chain.
- Improve international coordination among ocean literacy activities and mandate the integration of ocean knowledge and ocean learning experiences into provincial/territorial and national school curricula.

Capacity development priorities

- Capacity development for observations and data, information and knowledge management.
- Build on existing initiatives, technology and tools.
- Draw up inclusive and integrated knowledge and decision-making processes.
- Encourage community-based capacity development needs.
- Create greater opportunities to encourage and support early career researchers and ocean professionals.
- Democratize how knowledge is shared and accessed, along with practices, low-cost technology and tools.

Example future Decade actions

- Create a risk map of the North Atlantic Ocean basin which includes coastal and offshore areas to inform the design of multi-hazard warning systems.
- Development of tools for effective transboundary decision making, for example though marine spatial planning.

Relevant cross-cutting issues

- There is a need for better integration of social science and natural science to co-design and co-deliver ocean science and tools. This will include the development of transformative governance structures, integrated economic assessments for resolving interactions and conflicts between different economic activities, the integration of different knowledge systems, support to the reinforcement of equity and social justice systems, and the effective integration of science into policy.

MEDITERRANEAN SEA	Venice, Italy, 21–23 January 2020	No. of participants: Approx. 160	Weblink

Regional scientific priorities

A clean ocean

- Strengthen regional assessments and marine litter monitoring plans.
- Upscale regional initiatives.
- Acknowledge the Integrated Monitoring and Assessment Programme.

A healthy and resilient ocean

- Set up efficient adaptive/mitigating strategies to react to the accelerated paths of change; carry out test case actions focusing on socio-ecological systems.
- Build a laboratory for climate change.

A productive ocean

- Define science-based safe and sustainable thresholds for economic operations in the Mediterranean Sea.
- Develop new innovative technological solutions for harvesting.

A predicted ocean

- Enhance observing and predicting capabilities.

A safe ocean

- Develop impact-based forecasting of marine multi-hazard early warning systems.
- Improve coastal and deep-sea observational systems.

A transparent and accessible ocean

- Strengthen the science-policy interface and the flow of knowledge from scientists to the diverse regional policy frameworks.
- Pursue an open-data approach to ocean data and knowledge.
- Understand future links with economy and societal needs.

An inspiring and engaging ocean

- Enhance 'Mediterranean Sea literacy' and participatory research.
- Improve connection and collaboration with existing Mediterranean networks and organizations.

Capacity development priorities

- Establish North-South and East-West collaboration aligning regional policy frameworks and initiatives.
- Build structured partnerships to overcome political constraints.
- Draw up a shared educational strategy for sustainable development.

Example future Decade Actions

- The Mediterranean Sea could be a laboratory for early warning observation and predictive capabilities for the assessment of the impacts of climate change and multi-stressors on marine systems.
- Collaboration among the science community, UNEP/MAP Barcelona Convention, the BlueMed Initiative and national policymakers.
- Programme of enhanced coastal predictions to increase community resilience in the face of global change.

Relevant cross-cutting issues

- It will be crucial to develop a strong communication strategy that will work in parallel with the science action plan, and to reach out to art and culture communities which are central to Mediterranean society.

NORTH PACIFIC	Tokyo, Japan, 31 July–2 August 2019	No. of participants: Approx. 160	Weblink

Regional scientific priorities

A clean ocean

- Better understand the spatial and temporal distribution of pollutants using standardized monitoring and modelling, taking into account diversity among different types of pollutants, and develop tailored guidelines to eliminate, reduce or mitigate effects of pollutants on species, ecosystems and humans.
- Improve science-based management and tools for remediation, waste management and disposal at sea.

A healthy and resilient ocean

- Standardize ocean health monitoring and reporting and develop regional data centres.
- Develop tools and capacities to understand existing and projected impacts of multiple stressors on ecosystems.

A productive ocean

- Reduce overfishing and realize the sustainable use of marine ecosystem services to ensure food security.
- Valuation of marine ecosystems services, including transboundary research.
- Improve fish stock assessments and sharing them across the region, including identification of ecosystem thresholds and indicators of sustainability.
- Improve understanding of ecotoxicology, as well as issues affecting physical and mental health linked to changes in ocean condition.
- Enhance value chain analysis in fisheries, as well as increased knowledge on climate adaptation options for fisheries.

A predicted ocean

- Develop tools to ensure that predictions cover the range of temporal scales over which end-users can make decisions, i.e. seamless forecasts ranging from short-term forecasts to seasonal to multi-annual predictions (at a high resolution).
- Develop ocean acidification forecasting tools and capacities.
- Improve ocean circulation and ocean temperature forecasts, including predicting changes in marine species distribution or migration patterns.
- Develop innovative coupled models to address ocean-atmosphere-land-cryosphere interactions.
- Develop the use of AI for physical and biological predictions.
- Develop innovative data visualization tools that are useful for diverse actors and for educational purposes .

A safe ocean

- Develop improved inundation modelling for tsunamis.
- Prioritize research to build resilience to typhoon, tsunami and harmful algal blooms.

An accessible ocean

- Facilitate a culture of data sharing, including standardization of data collection, management and dissemination tools.
- Encourage interdisciplinarity and collaboration across disciplines in the generation, sharing and management of data.

An inspiring and engaging ocean

- Develop methods to characterize and incorporate indigenous and local knowledge systems.
- Change the narrative of ocean science from identifying a problem to supporting the design of a solution.
- Integrate science and art/culture in partnership with maritime museums and aquariums.

Capacity development priorities

- Increase investment and commitment in ocean observation.
- Ensure delivery of knowledge and information to decision makers and other societal stakeholders.
- Build sustained long-term training courses and strengthen the IOC-UNESCO Regional Network of Training and Research Centres (RTRCs) on Marine Sciences to address uneven capacities across the region.

Example future Decade Actions

- Develop Integrated Coastal Zone Management and Marine Spatial Planning for Asia-Pacific region.
- Coordinate support for expanded deployment of biogeochemical ARGO.
- Create a SMART prediction and information decision-support system based on simulation and prediction.
- Regional Strategy for Pacific Women in Maritime 2020–2024.

Relevant cross-cutting issues

- Engage private sector (oil and gas companies) and financial institutions and promote citizen science for public involvement.
- Develop state-of-the-art technologies (AI, space-ocean science).
- Expand computational facilities in Small Island Developing States (SIDS) and Least Developed Countries (LDCs).

WESTERN TROPICAL ATLANTIC OCEAN	Merida, Mexico, 28–29 April 2020 (virtual event)	No. of participants:	Weblink

Regional scientific priorities

A clean ocean

- Harmonized regional governance that overcomes geopolitical and economic diversity of the Western Tropical Atlantic Region to achieve a clean ocean.
- Wastewater treatment to be considered by water utility managers and stakeholders as a higher priority.
- Nutrient and agriculture runoff (and impact and causality) on Sargassum to be further studied.
- Policy design on marine litter and macro-plastics to be furthered (i.e. go beyond ban on plastic bags).

A healthy and resilient ocean

- Regional monitoring systems to be integrated into information systems and clearing house mechanism (CHM) which provide information on the biodiversity health status and contribute to decision making.
- Mapping of ecosystems at different depths (especially seabed) with the best possible scale and for this, making public-private strategic alliances for the costs, data, observing platforms, and expertise and multilateral alliances for areas beyond national jurisdiction.
- Share capabilities and tools for accessing spatial information.
- Use new technologies, innovations and methods (e.g. environmental DNA and big data), existing data and databases to fill existing data and observation gaps and to demonstrate significant progress in species identification and understanding of anthropogenic drivers, biodiversity and ecosystem function. Take into account the diversity of knowledge (e.g. indigenous).
- Understand combined effects of stressors in marine and coastal ecosystems and biodiversity at multiple scales, as well as the influence of tele-connections (e.g. between ocean basins and continents) on the climate and ocean processes.
- Understand how to connect the existing ocean, biodiversity and socio-economic variables for evaluating ecosystem services and developing area-based management tools.

A productive ocean

- Implement long-term intergovernmental management approach to sustainable fisheries based on reliable information and sound science, which includes small-scale fisheries management.
- Enhance fisheries research and monitor activities in order to understand the impact of industrial and small-scale fisheries on the marine environment, to develop targeted management measures to ensure sustainability and compliance with the current environmental legislation and international agreements.
- Research and invest to encourage the promotion of the Blue Economy and increase knowledge on impacts of Blue Economy activities, including the need for a better understanding of the socio-economic value of ocean products and services.

A predicted ocean

- Develop an ensemble of interdisciplinary models that can be used in early-warning systems for multiple stressors, approaching tipping points and extreme events.
- Strengthen network of global observations (including high-resolution bathymetry) for parameterization of models, and for improving forecasting and monitoring capacity.
- Integrate new technologies into a network of Internet of Things where data is made available and processed in real-time.
- Ensure sustainable ocean observations to provide long-term ocean data.
- Capacity development to ensure that through sustainability science, we can better integrate sustained ocean observations, data collection, and forecasting into evidence-based policymaking and ecosystem-based management.

A safe ocean

- Develop a regional multi-hazard ocean data and forecast system linked to education, outreach and communication actions to empower ocean communities. Promote public-private cooperation, resource mobilization and research aimed at integrated risk management in consideration of the multi-hazard nature of the region (COVID-19, hurricanes, drought, Sargassum, tsunamis, pollution, coastal erosion and sea-level rise).
- Foster an integrated approach of science and local and traditional knowledge; develop a network for the exchange of knowledge/analysed data and action strategies among coastal populations and maritime sector within the region to strengthen policy and decision-making at all levels; build appropriate infrastructures for the Decade (capacity-development, education, outreach).

An accessible ocean

- Harmonize regional governance; overcome geopolitical and economic diversity, and concomitant diversity in priorities at the local, country and subregional levels to achieve the societal outcomes in the WTA; policy design on marine litter and macroplastics to be furthered (i.e. go beyond ban on plastic bags).
- Ensure that information access systems for data sharing and interoperability are publicly available within 12–24 months, and some in real-time, for specific products and services tailored to different stakeholders needs.

An inspiring and engaging ocean

- Involve young scientists in the Decade.
- Indigenous communities of the region should be engaged in the Decade to document and use indigenous knowledge and to exchange new knowledge and capacity.
- Develop four priority areas identified for OL: (i) advancing policy, (ii) formal education, (iii) corporate action and (iv) community engagement.
- Include traditional knowledge as an essential approach to understand and to study the ocean.
- Promote communication: knowledge mobilization and education across all stakeholders involved in decision-making (including fishers and indigenous communities).

Capacity development priorities

- Needs-driven in the region, with investment in tools that can match demand.
- Create an inventory of existing and sustained capacity-development efforts.
- Best practices in capacity development need to be documented, coordinated and archived with the IOC-UNESCO Ocean Best Practices System to enable interoperability and intercomparability of observations.
- Indigenous communities should be engaged in ocean capacity development to document and use indigenous knowledge.

Example future Decade Actions

- Develop a harmonized, region-wide data collection, analysis and research programme of the flow and impacts of all pollutants in the Western Tropical Atlantic.
- Build capacity to understand, map and protect marine and coastal ecosystems and services at a regional scale.
- Develop a regional multi-hazard ocean data and forecast system linked to education, outreach, readiness and communication actions that empowers and recognizes national and local policy and decision making.
- Create an inventory of existing, sustained capacity development efforts in each region, implement a coordinated strategy to address regional capacity development challenges and establish a robust communication mechanism.

Relevant cross-cutting issues

- Prioritize interdisciplinary research multi-stakeholder engagement and training opportunities.
- Integrate early career ocean professionals.
- National commitments and activities on ocean literacy can be expanded to the regional and global levels.
- The region needs to establish a common blue economy strategy/agenda.

NORTHERN/CENTRAL INDIAN OCEAN AND MARGINAL SEAS	Chennai, India, 8–10 January 2020	No. of participants: Approx. 100	Weblink

Regional scientific priorities

A clean ocean

- Generate knowledge needed to promote a circular economy to reduce marine litter and to improve plastic recycling.
- Develop monitoring and management of marine litter and research on microplastics.
- Enhance knowledge on measures to reduce the impact of oil spills, and the development of ecologically benign oil spill dispersants.

A healthy and resilient ocean

- Increase understanding of the thresholds and boundaries between healthy and unhealthy ecosystems.
- Identify the drivers affecting the ecosystems, including biofouling and invasive species.
- Increase knowledge to support restoration to achieve healthy ecosystems.

A productive ocean

- Involve local communities and use local knowledge for the protection and conservation of resources, and to promote the optimization of ecosystem services.
- Develop knowledge to underpin synergistic operational models combining capture fisheries and sustainable mariculture.
- Develop understanding of the economic and social development benefits of fisheries and aquaculture.

A predicted ocean

- Reinforce regional collaboration to improve ocean predictions.
- Improve warning systems to eliminate false alarms about possible extreme events.

A safe ocean

- Develop knowledge and tools to improve at-sea safety.
- Enhance the use of effective tools for coastal zone vulnerability assessment.

An accessible ocean

- Promote use of citizen science and user-oriented data collection to contribute to ocean knowledge systems.
- Promote an internationally developed and recognized data policy for ocean data.

An inspiring and engaging ocean

- Embrace local and indigenous knowledge and practices in decision making and management.
- Expand and enhance ocean literacy activities throughout the region.

Capacity development priorities

- Develop proper models for risk assessment for operations at sea and a comprehensive coastal vulnerability assessment.
- Develop guidelines to address specific ocean management challenges.
- Reinforce user-driven data and information and an accessible data system/portal, coupled with an internationally developed and recognized data policy.

Example future Decade actions

- Establish an Indian Ocean leadership mentoring network.
- Establish an Indian Ocean Youth Leadership Network of ocean, climate and atmospheric scientists and professionals.
- Establish a data hub for the mid-eastern region under the IOCINDIO platform.
- Develop a regional framework for coastal vulnerability towards the safety, security and sustainable development of Member States in the Indian Ocean and develop joint cooperative programme on coastal vulnerability.
- Reinforce the tsunami early warning system in the Indian Ocean.

Relevant cross-cutting issues

- Ocean observations best practices will be essential for ocean observation-related initiatives planned during the decade.
- Support is required for inter-regional, South-South cooperation and exchange, particularly between different parts of the wider Indian Ocean basin.

AFRICA AND ADJACENT ISLAND STATES	Nairobi, Kenya, 27–29 January 2021	No. of participants: Approx. 120	Weblink

Regional scientific priorities

A clean ocean

- Develop regional assessment and monitoring framework for marine pollutants, including standardized monitoring methods.
- Generate knowledge for the development of innovative tools for tracking of marine pollutants, and maintain up-to-date knowledge of sources and quantities of pollutants in the ocean.
- Generate knowledge needed to promote a circular economy that reduces marine litter and promotes improved plastic recycling.

A healthy and resilient ocean

- Improve ecosystem-level understanding of marine systems and their vulnerabilities to climate change.
- Increase knowledge to allow development of policies that recognize the importance of healthy marine ecosystems.
- Expand knowledge about effects of different governance models on ecosystem health, including understanding of the impacts of conflict or weak governance on resource use and ecosystem health.
- Support research and development of innovative tools to promote good compliance with ecosystem management policies.
- Increase understanding of marine ecosystems – including deep-sea ecosystems – and the impacts of global change on ecosystems species movement, range shifts or changes in productivity via ecosystem-level vulnerability assessments.

A productive ocean

- Increase understanding of anthropogenic pressures, including mineral exploitation, construction of container terminals or port infrastructure on marine ecosystems, and use marine spatial planning to resolve conflicts between uses and ecological and social values.
- Increased knowledge of fish catch and fishing effort data, including regular stock assessments.
- Knowledge for improved fishing technologies and techniques.
- Increased knowledge to underpin alternative livelihood strategies for coastal communities.
- Further understanding of the nature and extent of the IUU fishing in EEZs and in areas beyond national jurisdiction.
- Better understanding of anthropogenic impacts on fisheries.

A predicted ocean

- Improve models and access to models for a range of issues, including ecological and ecosystem modelling, harmful algal blooms, climate downscaling and ocean-atmosphere interactions.
- Improve subseasonal to seasonal forecasting.

A safe ocean

- Develop knowledge and models to allow risk assessment of operations at sea and thus improve maritime security.
- Improve modelling of extreme events and their impacts for coastal zone management and community resilience and preparedness.
- Improve capacity in coastal zone vulnerability assessments.
- Increase knowledge of the efficiency of nature-based solutions for climate adaptation, e.g. coastal protection through mangroves.

An accessible ocean

- Develop an inventory of existing and potential data platforms and repositories and enhance interoperability between different tools.
- Invest significant efforts in data and knowledge accessibility, generation, sharing and management across all relevant disciplines.
- Invest in data rescue, and salvage and optimize existing but unused or hidden datasets.
- Coordinate data acquisition and discovery, including improved access to industry-held data.
- Develop and share best practices and methodologies for data management, including common data policies.
- Build on existing regional and international initiatives for data collection and actively ensure the involvement of African scientists.
- Develop systems for curating and managing African data while maintaining connectivity to the global database landscape.

An inspiring and engaging ocean

- Encourage citizen science and participatory monitoring and data collection initiatives as a means of expanding knowledge systems and raising awareness on ocean issues.
- Develop mechanisms and pathways to embrace local and indigenous knowledge to complement digitized data sources.

Capacity development priorities

- Develop regional climate centres to coordinate adaptation and resilience knowledge sharing and action.
- Establish state-of-the art African research facilities as 'centres of excellence'.

SOUTH ATLANTIC	Rio, Brazil, 25–27 November 2019	No. of participants: Approx. 120	Weblink

Regional priorities

A clean ocean

- Provide current status of contamination by the measurement of key potential contaminants on several spatial and temporal scales and provide sources inventory for all groups of contaminants.
- Develop indicators of environmental marine quality for different ecosystems and identify the main impact drivers (e.g. mining, fisheries, tourism, aquaculture, oil industry, maritime transportation, etc) and consider their synergic interactions.
- Determine the caring capacity for ecological and biological significant areas (e.g. Antarctic, Abrolhos, Amazon).
- Define acceptable level for all kinds of pollution, set baseline and threshold values and apply an ecosystem approach to evaluate pollution.

A healthy and resilient ocean

- Understand combined effects of stressors in marine and coastal ecosystems and biodiversity at multiple scales.
- Develop tools to connect the existing ocean, biodiversity and socio-economic variables for evaluating ecosystem services and develop area-based management tools.
- Understand the influence of tele-connections (e.g. between ocean basins and continents) on the climate and ocean processes.
- Map marine habitats in general, especially seabed (e.g. rhodolite beds, Amazonian mouth corals, seagrass beds, cold water corals).

A productive ocean

- Improve understanding of trade-offs between different uses of the ocean and its resources.
- Develop multi- and transdisciplinary science/information to develop regional marine spatial planning, integrating all the southern Atlantic.
- Complete knowledge of ecosystem dynamics in support of sustainable fisheries.

A predicted ocean

- Establish operational modelling centre for the eastern Atlantic
- Develop regional solutions for more sustained observations (surface and deep ocean).

A safe ocean

- Understand the influence of the Antarctic Ocean on the South Atlantic and improve pathways to regionalize essential ocean variable classifications.

An accessible ocean

- Improve bathymetry data for the ocean basin.
- Use citizen science (crowd-sourced science) and link it to FAIR principles.
- Assure data quality for measurements, i.e. metadata, accuracy, calibration.
- Consider historical and ongoing data collection activities, e.g. scientific cruises, industry, military.

An inspiring and engaging ocean

- Work and communicate in different languages; shift global perceptions by using professional science communicators to work with scientists to promote the new ocean narrative to other audiences outside the traditional science channels.
- Creation of a programme for the dissemination of marine sciences at different levels of education for people living in the coastal region.

Capacity development priorities

- Strengthen South-South cooperation in the South Atlantic.
- Address knowledge gaps in the ocean-atmosphere-land connections with regard to processes and models, and seasonal to interannual variability.
- Promote a better integration and use of existing research platforms (asymmetry in capacity in the region, utilization of industry cruises, vessels of opportunity).

Example future Decade actions

- Network installation of water quality sensors in rivers.
- Programme for the dissemination of marine sciences at different levels of education for people living in the coastal region.
- Creation of a coastal and oceanic monitoring programme in the South Atlantic.
- Strengthen training programmes with a focus on marine spatial planning, with special emphasis on the South Atlantic.

Relevant cross-cutting issues

- Social, economic and natural sciences must be integrated in order to develop science-based public and private policies.
- Communication: importance of framing a timetable for actions and goals which should be coordinated in the South Atlantic region in the short, medium and long term, by identifying all the steps and actions needed to reach those goals within the timetable. This timetable will facilitate planning, resources search, monitoring of indicators, and will take into account all the cultural, social, scientific and economic realities in the South Atlantic region.
- Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms. The All-Atlantic Ocean Research Alliance could serve as a model to extend cooperation in ocean research and innovation. Investigating the existing Atlantic initiatives (All-Atlantic Cooperation for Ocean Research and Innovation, AANChOR), new models of cooperation on a coordinated and partnership-based approach should be encouraged. There is a need to include social sciences as well as traditional knowledge in the midst of discussions, to inform policymakers and develop truly inclusive science-based policies.
- Youth inclusion in the UN Decade of Ocean Science should be considered as a priority.

PACIFIC COMMUNITY	Noumea, New Caledonia, 23–25 July 2019	No. of participants: Approx. 70	Weblink

Regional scientific priorities

A clean ocean

- Inventory and prioritize pollution sources and impacts, and inventory scientific expertise within and beyond the region.
- Knowledge to develop alternatives to reduce pollutants at the source.

A healthy and resilient ocean

- Define restoration and ecosystem resilience initiatives from a Pacific cultural context, using transdisciplinary approaches, exploring resilience, rebounding of ecosystems after extreme events; document and include traditional practices that preserve ecosystems.
- Increase ecosystem-level understanding of the reaction of ecosystems to climate change.

A productive ocean

- Better understanding of the chemical and biological impacts of aquaculture, including the effects of invasive species.
- Understand the effects of extreme events, ocean acidification and deoxygenation on ocean productivity.
- Increase knowledge of the role of small-scale fisheries in food security, livelihoods, diet and nutrition, as well as cultural values.
- Increase understanding of the impacts of blue economic growth on fisheries.
- Strengthen the science-policy interface in terms of sustainable harvesting of the Southern Ocean.

A predicted ocean

- Couple predictive modelling and partnerships between users and build the observation and modelling community.
- Improve ocean forecast services for the benefit of society and increase the diffusion of user-relevant predictions.
- Enhance regional modelling capacity, including in terms of coupled predictive modelling at a variety of timescales.

A safe ocean

- Quantify risk to strengthen community preparedness and resilience, and develop early warning systems that can provide localized forecast and impact information.
- Improve methods and data for tsunamic source modelling and early warning systems.
- Integrate indigenous and local knowledge into early warning systems for ocean hazards.
- Better understanding of human physical and mental health impacts from changes in ocean condition or changes in biodiversity.

An accessible ocean

- Identify and prioritize Pacific community values (cultural, scientific and economic) and needs for ocean data; capture and recognize traditional knowledge in the collection process; strengthen agreements to standardize data collection, management and dissemination, and improve data and accessibility.
- Improve infrastructure and capacity to collect, access, manage, store and use data across all relevant disciplines and increase efforts in data salvage and rescue.
- Develop solutions to combine data from numerous data portals from large scale to local level and develop regional and national capacity for data processing, data analysis, and data and information management.
- Support initiatives for user-driven data and facilitate conversion to useful products for diverse user groups.

An inspiring and engaging ocean

- Ensure that local and indigenous knowledge are central elements of data and information used for decision making.

Capacity development priorities

- Enhance the region's modelling capacity at all appropriate scales.
- Build capacity in the use of products and services with cyclical monitoring and evaluation.
- Provide networking opportunities and facilitate scholarships.
- Develop adaptive solutions that allow for whole lifetime research within the Pacific (rather than preliminary and first tier research).

Example future Decade actions

- Design and implement an appropriate bio-physical-ocean-climate Pacific Ocean Observing System (Pacific-OOS), to inform and link to PI-GOOS, Pac-IOOS and IMOS.
- Promote the creation of an MPA network for the South Pacific Ocean, which helps coordinate efforts and improve management in the conservation of marine biodiversity.
- Regional Strategy for Pacific Women in Maritime 2020–2024.
- Involve the Pacific Alliance.

Relevant cross-cutting issues

The University of the South Pacific offered draft guidelines for the integration and mainstreaming of indigenous knowledge systems (IKS) and traditional knowledge (TK) as a cross-cutting issue at the South Pacific workshop.

- Recognize TK as a cross-cutting priority: embed IKS/TK in all Ocean Decade priorities.
- Official documents and action plans: recognize and articulate IKS/TK as an important and complementary knowledge economy of global benefit.
- Guiding resources: establish guidelines for integrating and mainstreaming IKS or TK; develop a guiding document for 'TK in the Ocean Science Decade'; utilize existing resources for the integration of culture into SDGs.
- Due ethical and moral process: initiate a consultative consensus-building process to develop guiding ethical and moral obligations that need to be observed and accorded to the ocean as a living entity and to cultural communities.
- Methodologies: co-create innovative tools and instruments, processes and training approaches for Ocean Decade initiatives.
- Broad and inclusive research agenda: develop regional action plans.

SOUTHEAST PACIFIC	Guayaquil, Ecuador, 24–26 September, 2109	No. of participants: Approx. 55	Weblink

Regional scientific priorities

A clean ocean

- Reinforce knowledge about sources of pollution, types of pollutants and their effects, and strengthen monitoring systems.
- Better knowledge and solutions for harmful algal blooms, drifting plastics and invasive species.
- Understand rates of carbon dioxide increase and impacts of ocean acidification.
- Determine ranges of tolerance of species and ecosystems to different types of pollutants.

A healthy and resilient ocean

- Strengthen marine biodiversity inventories through the use of DNA barcode registration.
- Develop knowledge and solutions to protect marine ecosystems in the deep sea, including mapping of the ocean floor.
- Develop indicators of dynamic ecosystem services and integrated regional ecological monitoring networks.
- Evaluate functional ecological connectivity at the regional level to prioritize conservation areas as part of a regional network.
- Understand impact of sedimentation from deforestation on the health and resilience of coastal and marine ecosystems.
- Develop standardized methods for the identification of anthropogenic stressors on ecosystems, particularly in the face of global change.

A productive ocean

- Evaluate the cumulative impact of high-intensity fisheries systems on ecosystems and ecological services in coastal zones and in the high seas.
- Enhance and share tools to increase the application of ecosystem-based management approaches to fisheries.
- Use marine spatial planning and area-based management tools to optimize the productivity and sustainability of fisheries.
- Develop and implement multi-use marine conservation area models to support sustainable blue growth.
- Understand effects of climate change on fisheries, resources and coastal economies, and understand such impacts compared to impacts of overexploitation of resources.
- Develop tools to measure sustainability of environmental assets, including ecosystem goods and services and ecosystem health.
- Integrate empirical knowledge of fishing communities in fisheries management approaches.
- Develop knowledge to underpin sustainable aquaculture practices and improve decision-making tools for siting of aquaculture developments.

A predicted ocean

- Dynamic mapping of coastal and ocean areas in the countries of the region and mapping of ocean floors (physical, chemical, biological) beyond and within the jurisdiction of the regional countries, definition of indicators of dynamic ecosystem services and coupled economic and ecological models.
- Improve knowledge on physical and biogeochemical dynamics in the region, including development of short- and long-term models.
- Improve ocean forecasts and the utility of data products shared with users.

A safe ocean

- Base adaptation and risk management on ecosystems, science and traditional knowledge.
- Improve knowledge of physical and biogeochemical dynamics in the region.
- Undertake coastal vulnerability analysis throughout the ocean basin.
- Strengthen tsunamic warning systems.
- Improve knowledge on nature-based solutions for adaptation to climate change and ocean hazards.

An accessible ocean

- Adopt policies for access and exchange of data and information.
- Improve infrastructure and capacity to collect, access, manage, store and use data across all relevant disciplines, and increase efforts in data salvage and rescue.
- Expand the use of citizen science and participatory science initiatives to generate data across a range of disciplines.
- Trigger an ocean data revolution by increasing interoperability of data systems and through the use of AI, big data and disruptive technologies.

An inspiring and engaging ocean

- Establish a research focus on socio-ecological systems in the region.
- Support ocean literacy efforts throughout the region to multiple audiences, including government, private sector and youth.

Capacity development priorities

- Develop industry/academia partnerships for data collection.
- Draw up agreements and share available technology in the region to correct existing imbalances and develop exchange mechanisms.
- Strengthen training in numerical modelling and access to high-level IT infrastructure.

Example future Decade actions

- Integrated regional monitoring systems (e.g. Regional Alliance of the Global Ocean Observing System for the Southeast Pacific).
- Programme for mapping the Southeast Pacific seabed.
- Programme for marine life inventory with eDNA data.
- SPINCAN Southeast Pacific Data and Information Network to support the Integrated Coastal Area Management Project.

Relevant cross-cutting issues

- Ancestral and traditional knowledge is a vital component of the Ocean Decade.
- The Ocean Decade should ensure gender equity throughout all its initiatives and activities.

SOUTHERN OCEAN	San Diego, USA, 16 February 2020	No. of participants: Approx. 30	Weblink

Regional scientific priorities

A healthy and resilient ocean

- Improve understanding of sea ice, including its role in ecological processes, and the role of the Southern Ocean in biogeochemical cycling with specific reference to the exchange of carbon dioxide in the global carbon cycle.
- Understand the key biological, physical and chemical drivers of change and their impacts on Southern Ocean species and food webs.

A productive ocean

- Increase the suite, type and reliability of measurements, including those focused on ecosystem change, needed to inform management and policy.

A predicted ocean

- Continental shelf and coastal regions are under-sampled, observations of critical austral autumn and winter processes are limited – enhance and expand observational capability to support predictions and develop a predicted Southern Ocean model (climate, circulation, cryosphere, ecosystems). Coordinate and support existing programmes.
- Improve and enhance Southern Ocean modelling capability (decadal predictability, high-resolution regional models) and include larger scale models. Improve remote sensing capability.
- Increase availability of essential data related to high-resolution regional bathymetry, wind observations, carbon dioxide uptake and outgassing and fluxes of deep water.

A safe ocean

- Improve understanding of key drivers (physical, chemical, biological) of change and their impacts (including impact of multiple and synergistic drivers) on Southern Ocean ecosystem structure and functioning species, in support of conservation and management.
- Develop research and management plans that demonstrate the effectiveness of Southern Ocean MPAs. Develop a risk assessment decision-making model and couple it with ecosystem models that are used for decision making.

An accessible ocean

- Develop innovative partnerships and methods for data collection, including with tourist boats.
- Encourage user-driven data identification and collection and ensure that data products are geared towards users' needs.

An inspiring and engaging ocean

- Facilitate collective actions towards the development of a sustained coherent and synergistic campaign of outreach activities to the public and policymakers.

Capacity development priorities

- Develop programmes to engage new research communities and early career researchers in Southern Ocean activities and build a community with transdisciplinary capability (e.g. national and international programmes focusing on education, training and capacity development).

Example future Decade actions

- Circumpolar international coordinated field programme for understanding sea-ice processes with multi-season observations, including ship- and autonomous platform-based studies to observe both below and above the sea ice.
- Develop high-resolution models to explore sea ice dynamics and links to biology.
- Develop required infrastructure and training to create a sustained, coherent and synergistic campaign of outreach activities to improve societal understanding of the Southern Ocean and appreciation for its global value in earth systems (global climate, CO_2 uptake, global ocean productivity), which can be facilitated through the communication action plan of the Ocean Decade.
- Enhance costal and continental shelf observing networks.

Relevant cross-cutting issues

- Undertake planning for remote sensing capability to enhance the ability to forecast and project circulation, ecosystems and their interactions over a range of space and time scales in the Southern Ocean.
- Frame Southern Ocean questions and issues in terms of social needs and develop a community that bridges the gap between science and the public and can communicate the transdisciplinary nature of the Southern Ocean issues.
- Implement a coordinated, international, circumpolar observational programme to elucidate processes that (i) quantify life histories of key species, (ii) allow a total carbon budget to be developed, (iii) provide coverage of the annual cycle and (iv) quantify the role of sea ice in regulating ecosystem productivity. The UN Decade of Ocean Science may provide a platform for engaging national programmes in such an effort.
- Raise participation and importance of the Southern Ocean through the UN Decade of Ocean Science. The Southern Ocean community needs to be more visible in activities such as OceanObs and other international ocean efforts.
- Enhance predictive skill across climate, circulation, cryosphere and ecosystems. The Southern Ocean community can add scenarios, such as freshwater inputs in the Southern Ocean, to understand climate sensitivity.
- Facilitate capacity development and develop programmes to engage early career researchers and build new research communities with transdisciplinary capability in Southern Ocean activities.

Part 3. How to get involved at national and regional level in the Decade

Continued efforts to translate the global priorities of the Decade to regional- and national-level action will be essential to the Decade's success. The Ocean Decade Implementation Plan contains a framework for diverse groups of partners to identify, implement and resource Decade Actions to fulfil the Ocean Decade Challenges and thus contribute to the Ocean Decade vision. Building on the foundation created through the regional consultation workshops, different mechanisms exist to facilitate such efforts.

- **Lead or join a regional stakeholder group**

The Ocean Decade will encourage voluntary stakeholder engagement networks to register as official partners of the Decade. A number of regional stakeholder groups are already emerging, for example in the Pacific, the Arctic and in the Western Tropical Atlantic regions. These groups can play a role in convening and engaging stakeholders, identifying regional and thematic science and capacity development priorities, and ensuring alignment with ongoing and planned regional initiatives. They may also lead or coordinate the development of regional Decade programmes or projects. Many of these groups are developing regionally aligned action plans to build on the outcomes of the regional consultation workshops held in 2019 and to identify priorities for the development of future Decade Actions.

Box 3: National Decade Committees and Regional Stakeholder Initiatives

National Decade Commi ttees and Regional Stakeholder Committees are emerging around the globe to translate the global priorities of the Decade into regional and national action, and to coordinate partners who want to engage in the Decade. New structures are being established regularly, and you can **click here** to find out which national or regional structures are operating near you.

- **Lead or join a National Decade Committee**

The role of National Decade Committees is to facilitate and track national contributions to the Decade. There are no formal requirements for these committees but they are encouraged to engage multiple and diverse stakeholder groups. National Decade Committees are emerging in a number of countries in Europe, Asia, and South and North America, and it is hoped that many more will be formed in the coming months. The mandates of these committees are dynamic and include tasks such as acting as ambassadors to promote and raise awareness of the Decade, and enhancing stakeholder access to Decade benefits, such as data, forecasts, science-based decision-support tools, or capacity development opportunities.

Throughout the Decade, calls for Decade Actions will be launched to solicit programmes, projects and activities that will contribute to fulfilling the Ocean Decade Challenges and support the Ocean Decade vision. Regional or national Decade Actions that are co-designed by diverse stakeholders and that contribute to regional or national ocean science priorities are encouraged to be submitted for endorsement via this process.

- **Host a regional Decade collaborative centre**

Decade collaborative centres will form part of the governance and coordination structure for the Decade. Regional collaborative centres can be hosted by Decade partners and will have the mandate to catalyse Decade Actions at the regional or thematic level by providing technical, logistical and financial support for: (i) scientific coordination and planning; (ii) the identification of collaboration opportunities; (iii) communications, awareness raising and stakeholder engagement; and (iv) technical and scientific capacities to support Decade Actions. They will also provide advice to the Decade Coordination Unit on requests for endorsement of Decade Actions within the region.

- **Host or support regional workshops or conferences, including Decade launch conferences**

Members of the Global Stakeholder Forum will meet through regional Decade conferences that will be organized to convene stakeholders, evaluate progress towards the Decade vision, and catalyse new initiatives and partnerships. Regional events will commence in 2021, either on a one-off basis or as part of other meetings, and will focus on developing co-design collaborations, training on co-design approaches and showcasing successful initiatives. To ensure location diversity, governments, regional organizations, universities and other actors will be invited to host the Decade conferences. Decade regional collaborative centres will also play a key role in supporting the convening of these meetings.

Further information on these mechanisms can be found on www.oceandecade.org or by contacting oceandecade@unesco.org.

Learn more about engaging in the Ocean Decade on **oceandecade.org**

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