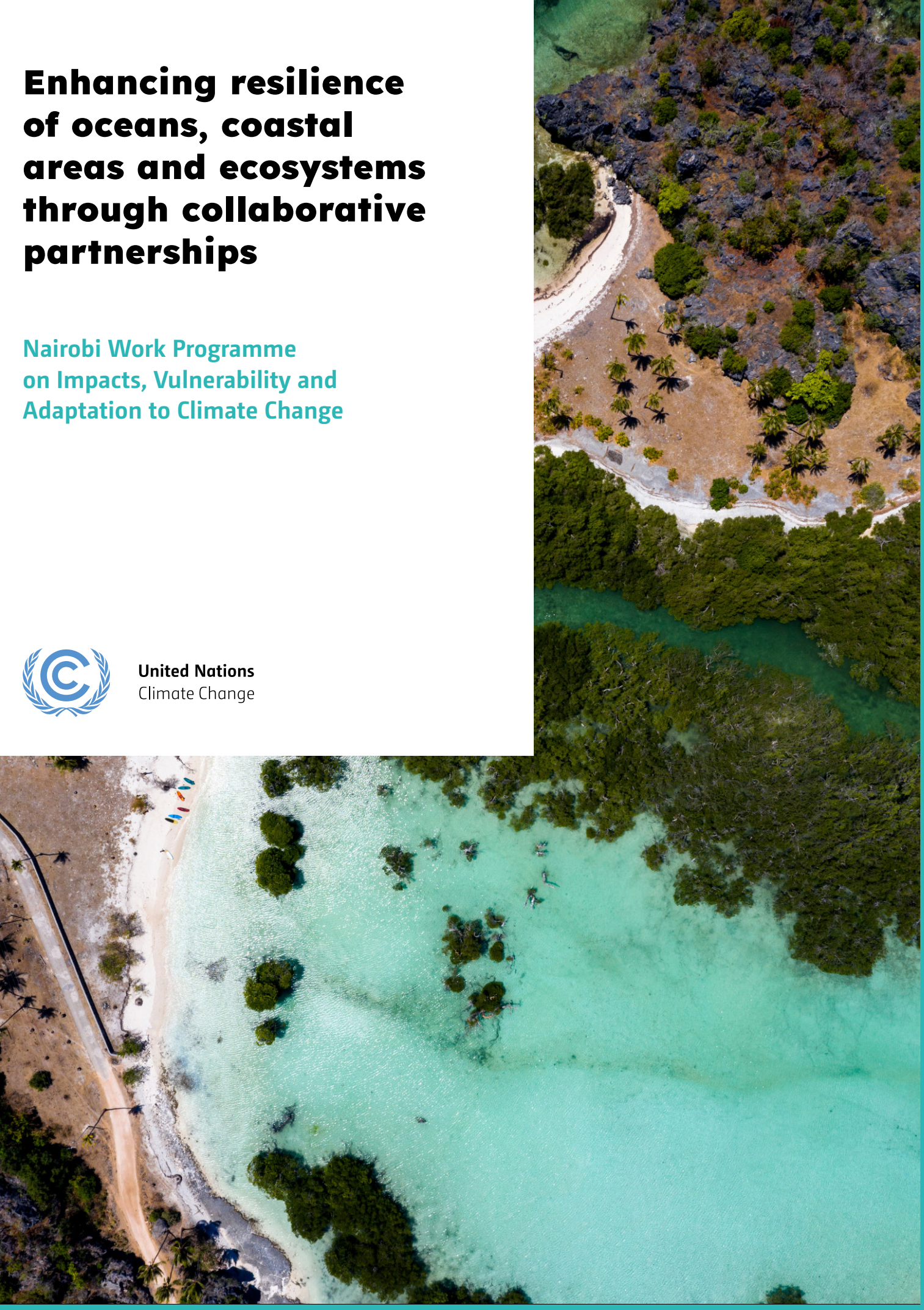
Enhancing resilience of oceans, coastal areas and ecosystems through collaborative partnerships

Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change

United Nations
Climate Change



Enhancing Resilience of Oceans, Coastal Areas and Ecosystems through Collaborative Partnerships

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Climate Change

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Foreword by the Chair of the Subsidiary Body for Scientific and Technological Advice

Dear reader,

Healthy oceans are instrumental in regulating the climate system and are integral to achieving the SDGs and the objectives of the Paris Agreement.

Mangroves, tidal marshes, coral reefs and sea grasses sequester and store more carbon per unit area than terrestrial forests. They also help safeguard coastal cities, communities and businesses from adverse impacts of a changing climate. The Intergovernmental Panel on Climate Change (IPCC) Special report on Oceans and Cryosphere (SROCC) warns that Small Island Developing States (SIDS), coastal megacities and communities are on the frontline of increasing climate impacts.

Ocean and marine ecosystems provide a space for action for governments, communities and stakeholders living with increasing risks in the next decades. A number of countries have communicated their intentions through Nationally Determined Contributions (NDCs), to increase adaptation efforts in ocean ecosystems, and to safeguard oceans to facilitate sustainable development.

Knowledge gaps in adapting to the impacts of climate change in coastal areas can pose barriers to countries to take necessary adaptation action. Nature-based solutions in the oceans and coastal areas are a vital part of strategies to strengthen livelihoods, ensure food security, and protect lives.

The Nairobi Work Programme (NWP), UNFCCC knowledge-to-action hub on adaptation and resilience, counts oceans, coastal areas and ecosystems among its priority areas. The NWP expert group on oceans, established in 2019, has taken over the challenge of bringing ocean-driven adaptation action to the surface, bridging knowledge gaps that will support countries in strengthening their work on ocean and climate adaptation.

The work under the NWP provides an opportunity to link with and build on existing initiatives and promote coherence to ensure effective outcomes for the ocean-climate nexus, boosting exchange of knowledge, experience and best practices.

This report highlights solutions and good practice for building resilience of oceans and coastal areas. The report also provides an overview of knowledge gaps and opportunities for coordinated action to address them. NWP partners are collaborating with countries and institutions to close these knowledge gaps so countries can scale up adaptation action.

Mr. Tosi Mpanu Mpanu
Chair of the Subsidiary Body for Scientific and Technological Advice

EXECUTIVE SUMMARY

A healthy ocean is essential in regulating the global climate system and is central to achieving the Sustainable Development Goals (SDGs). The goal of the Paris Agreement is to limit global warming to well below 2, and preferably to 1.5, degrees Celsius above pre-industrial levels. The Intergovernmental Panel on Climate Change (IPCC) Special Report on the Ocean and Cryosphere in a Changing Climate underscores that the world's ocean and cryosphere have been 'taking the heat' from climate change for decades. The consequences for the ocean, nature and humanity are sweeping and severe, including rising sea levels, ocean acidification, and increasing intensity and frequency of extreme events. This also affects the role of the ocean as a foundation for vibrant economies. Goods and services from the ocean generate about USD 2.5 trillion each year — an amount expected to double by 2030, making the ocean equivalent to the seventh largest economy in the world today.

The ocean provides a space for action for governments, communities and stakeholders living with increasing risks in the next decades. Action on adaptation is a vital part of policy frameworks for strengthening livelihoods and protecting lives, especially in the context of fisheries and ecosystem management and marine protected areas. The fisheries and aquaculture sector, in particular, is among the human activities most vulnerable to climate drivers.

A number of ocean initiatives at global, regional and national levels have been launched and are in progress in support of ocean action. However, there are gaps in effective ocean adaptation, representing challenges for developing countries in particular.

This report aims to strengthen understanding of the adaptation knowledge needs of countries as they relate to the ocean, curate and share knowledge, and outline actions to address knowledge gaps. This report is part of work under the Nairobi Work Programme (NWP) in collaboration with an expert group on oceans (Annex 1), aiming to assist Parties in building resilience of oceans, coastal areas and ecosystems.

Under the NWP, knowledge needs identified by governments were initially scoped and further refined through a technical expert meeting. The 13th NWP Focal Point Forum (see Annex 2) convened at the twenty-fifth session of the Conference of the Parties (COP) provided a platform to discuss knowledge gaps and collaborative actions across the following thematic areas:

A. **Governance and participation: Coordinate and strengthen approaches**

B. **Data and methods: Ensure availability of data and facilitate access to robust data and methods**

C. **Protection and restoration: Provide a collective, long-term and inclusive approach**

D. **Facilitate support for:**

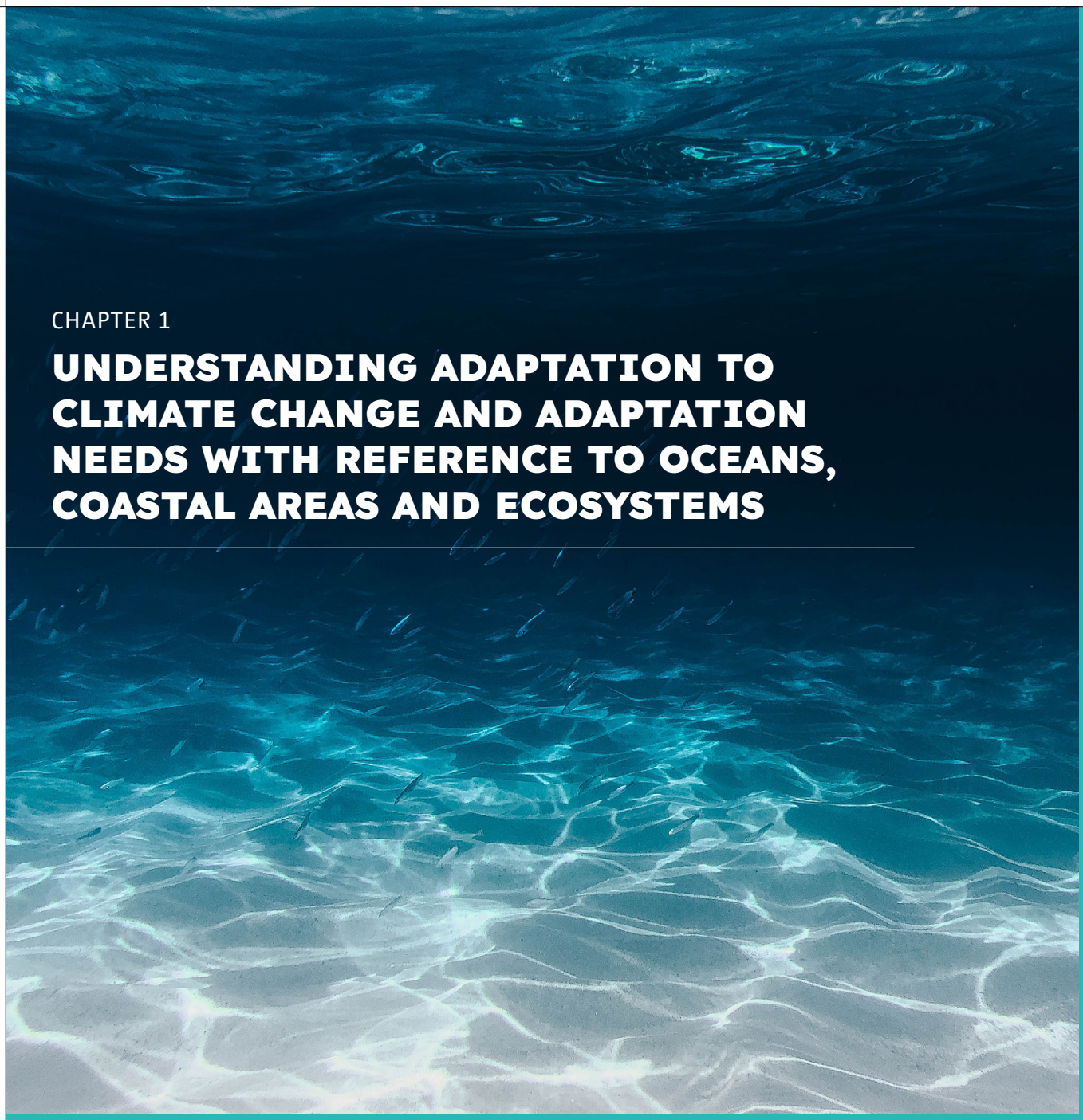
- capacity-building and education;
- technology and innovation;
- finance and funding.

The NWP will engage with the expert group on oceans to strengthen action on ocean and climate adaptation under the UNFCCC process. Building on the momentum to-date. The expert group can help address key ocean-climate gaps through collaboration among expert group members, and with the UNFCCC constituted bodies, other thematic expert groups of the NWP and relevant communities of practice (see chapter IV for an overview of collaborative actions in progress).

ACKNOWLEDGEMENTS

The UNFCCC secretariat would like to acknowledge the valuable contributions of the NWP expert group on oceans (see Annex 1) for their engagement in advancing the work on the thematic area of oceans, coastal areas and ecosystems since 2019. In particular, we gratefully acknowledge inputs in preparing the scoping paper, leading discussion groups during the 13th Focal Point Forum on oceans organized under the overall guidance of the Chair of the Subsidiary Body for Scientific and Technological Advice (SBSTA), and ongoing collaborations in addressing knowledge gaps in this thematic area.

The UNFCCC secretariat would also like to thank the following for reviewing the draft report: Denis Chang Seng (Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO)), Dorothée Herr (International Union for the Conservation of Nature (IUCN)), Emily Landis (The Nature Conservancy), Florence Poulain (Food and Agriculture Organization of the United Nations (FAO)), Ibukun Jacob Adewumi (World Ocean Council: African Marine Environment Sustainability Initiative), Khalissa Ikhlef (UNESCO), Lisa Schindler Murray (Rare), Loreley Picourt (Ocean & Climate Platform), Patrycja Enet (European Maritime Spatial Planning Platform), Valentina Germani (Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs of the United Nations), Veronica Lo (Puffin Environmental Consulting) and Vositha Wijenayake (SLYCAN Trust).



CHAPTER 1

UNDERSTANDING ADAPTATION TO CLIMATE CHANGE AND ADAPTATION NEEDS WITH REFERENCE TO OCEANS, COASTAL AREAS AND ECOSYSTEMS

The ocean is the primary driver and regulator of the global climate yet it is significantly affected by increasing greenhouse gas concentrations in the atmosphere. The IPCC Special Report on the Ocean and Cryosphere in a Changing Climate identifies that, due to emissions of greenhouse gases from human activities, the global ocean has warmed and absorbed more than 90 per cent of the excess heat in the climate system. The ocean has also absorbed 20–30 per cent of total human carbon dioxide emissions since the 1980s, leading to increased ocean acidification. Due to warming, marine heatwaves have doubled in frequency since the 1980s and are increasing in intensity. Loss of oxygen has occurred from the surface of the ocean to a depth of 1,000 m, increasing the number of dead zones. The global mean sea level has been rising at an increasing rate in recent decades owing to mass loss from the Greenland and Antarctic ice sheets and continuing glacial mass loss and thermal expansion of the ocean. Climate change has increased the number of observed precipitation, wind and extreme sea-level events associated with certain tropical cyclones, according

to the Special Report. Climate change is exacerbating the impacts of environmental and anthropogenic stressors on the ocean, which are increasing the vulnerability of coastal areas and ecosystems, such as mega deltas, coral reefs and mangroves.

Developing countries, including SIDS, are particularly vulnerable. The degradation of coastal and marine ecosystems threatens, in particular, the physical, economic and food security of indigenous peoples and local communities.

The IPCC Special Report identifies several ocean-climate linkages and highlights that (1) rapid greenhouse gas emission reductions are crucial; (2) a slower rate of ocean change would provide greater adaptation opportunities, although there are limits to adaptation; and (3) adaptation measures can generate many co-benefits for society. Protecting and restoring marine and coastal ecosystems will play a key role in helping communities adapt to climate change.

Climate change impacts act as threat multipliers when combined with other anthropogenic stressors. These may include unsustainable coastal and lagoon development, overexploitation of living marine resources, and habitat alteration combined with marine and land-based pollution. They in turn exacerbate challenges relating to food security, livelihoods and the well-being and sustainable development of communities (particularly vulnerable coastal groups). The cumulative effects of these impacts may cause changes at a pace such that marine ecosystems and species do not have sufficient time to adapt.[1]

Urgent action is needed, together with the need to share knowledge and best practices in order to leverage, accelerate and scale up the interventions needed for coastal adaptation and resilience-building. The ocean provides an opportunity for coordinated action on adaptation and mitigation measures to build resilience and generate co-benefits. Governments, communities and other stakeholders who depend on oceans for their economies, livelihoods and well-being will face increasing risks to their livelihoods over the coming decades. Over 70 per cent of initial nationally determined contributions (NDCs) submitted in 2015 and 2016 identified ocean-related action and referenced marine issues such as ocean warming and impacts on coastal areas, fisheries and marine ecosystems. [2] Most national adaptation plans (NAPs) submitted to date also include ocean-based adaptation with an increasing call by several Parties to strengthen ocean-related elements in NDCs.

However, there are still significant knowledge gaps relating to many aspects of adaptation, which present challenges, particularly for developing countries. Political momentum is building to fill these knowledge gaps and form action partnerships. Civil society, research institutes, international organizations, regional commissions and sea conventions, governments and other stakeholders play a major role in the process of implementing transformative action in closing adaptation knowledge gaps. Such actions at a global level could focus on the ocean-climate change nexus relevant to global sustainable development agendas and other international agreements such as the Post-2020 Global Biodiversity Framework.

The role of the ocean in climate change action is receiving ever-greater attention from stakeholders, governments, industries and scientists alike. The 2030 Agenda for Sustainable Development includes an SDG to conserve and sustainably use the oceans, namely SDG 14: Life below water. The United Nations General Assembly proclaimed a Decade of Ocean Science for Sustainable Development (2021–2030) to contribute to achieving SDG 14 and declared the same period as the United Nations Decade on Ecosystem Restoration, which aims to support and scale up efforts to prevent, halt and reverse the degradation of ecosystems, contributing to achieving a wide range of global development goals and national priorities. A number of ocean initiatives at the global, regional and national level have been launched in support of ocean action.

CHAPTER 2

LEVERAGING TECHNICAL EXPERTISE TO CLOSE KNOWLEDGE GAPS UNDER THE NAIROBI WORK PROGRAMME

How does the NWP enhance ambition through knowledge?

Despite the growing body of adaptation knowledge, knowledge gaps remain a critical barrier to enabling the scaling-up of adaptation actions. The NWP is a demand-driven knowledge-to-action hub on adaptation and resilience under the Convention. Established at COP 11, it was the first stakeholder engagement mechanism under the Convention. The knowledge gaps on adaptation and resilience identified in countries are addressed under the NWP in collaboration with over 425 partners. The partners represent a diversity of knowledge and expertise, coalitions and existing networks; each working within different thematic areas, sectors, regions and countries. In its role as a knowledge-to-action hub on adaptation and resilience, the NWP connects Parties, UNFCCC constituted bodies and non-Party stakeholders under the Convention through the curation, production and communication of knowledge and the establishment of partnerships for learning and collaboration on all aspects of climate change impacts, vulnerability and adaptation. The NWP responds to

knowledge needs identified by Parties, in particular by developing countries, including the least developed countries (LDCs) and SIDS, through the following ways (see also figure 1):

- Using a step-wise and progressive knowledge-to-action approach under which existing partners are convened and new partnerships are explored with the aim of finding ways to collaborate on curating, packaging and sharing knowledge to close knowledge gaps and meet knowledge needs in various thematic areas, countries and subregions;

- Supporting the implementation of activities related to National Adaptation Plans (NAPs), and providing support to the LDCs by supporting the LDC Expert Group (LEG) in assisting countries in formulating and implementing NAPs through the mobilization of NWP partners;

- Responding to knowledge needs identified by constituted bodies and providing credible knowledge relevant to other adaptation mandates arising from the Paris Agreement, such as in relation to adaptation communications and the global stocktake.

What is the progress to date in the thematic areas of oceans, coastal areas and ecosystems?

The SBSTA mandated the NWP to focus on the thematic area of oceans, coastal areas and ecosystems.[3]

Applying an iterative and progressive knowledge-to-action methodology, the secretariat collaborated with the expert group on oceans to advance actions (see figure 2 for an overview of progress to date).

As a demand-driven process, the knowledge needs of Parties were identified through a scoping paper based on a rigorous review of reports submitted by governments to the UNFCCC process, the IPCC Special Report and relevant literature and reports.[4]

These knowledge needs were further refined through engagement with the expert group on oceans. The NWP Focal Point Forum provided an opportunity to discuss the actions in an inclusive manner with governments, experts and other partners. The NWP is strengthening partnerships with the expert group on oceans to co-design actions to close these knowledge gaps, recognizing that these actions need to be aligned with existing work and the mandates of the relevant expert institutions, and that these actions inform the UNFCCC as well as relevant policy processes (see chapter IV for an overview of collaborative actions in progress). In this manner, the outcomes of these collaborative actions could be directly relevant for countries, particularly the LDCs and SIDS. Box 1 provides an overview of the expert group on oceans.

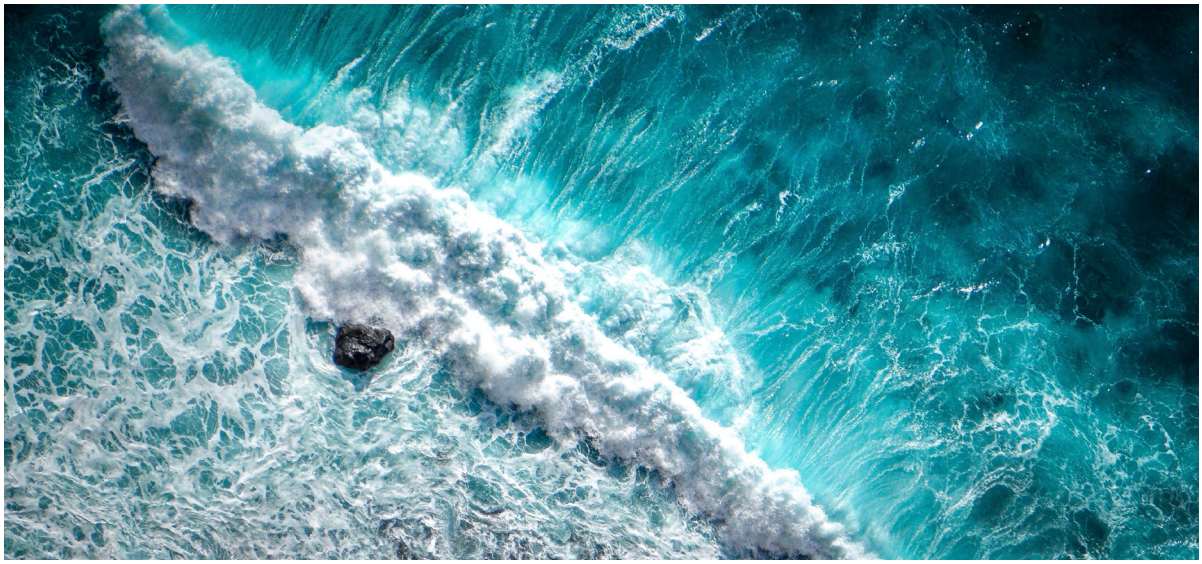


Figure 1: Integrated approach under the Nairobi work programme

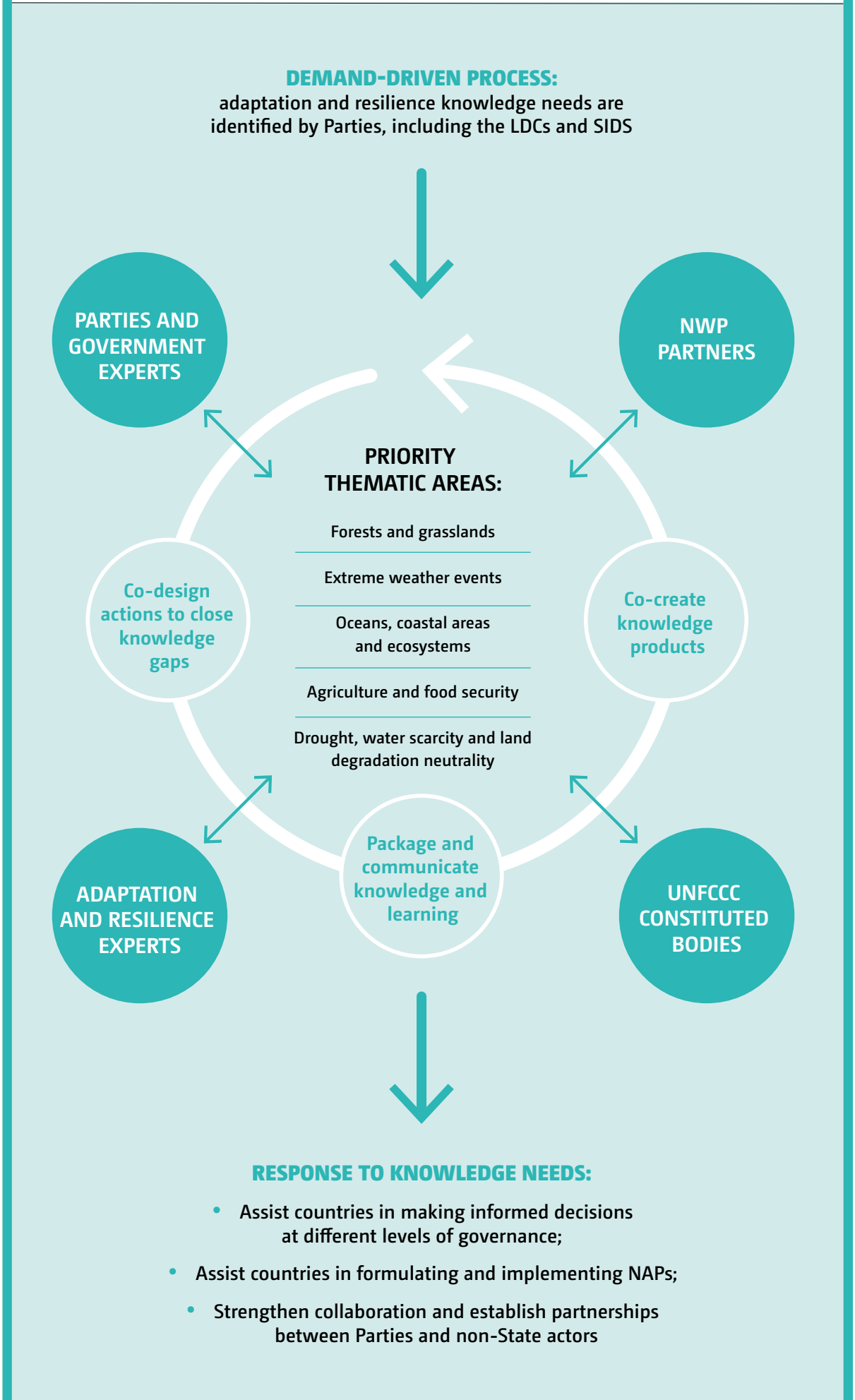
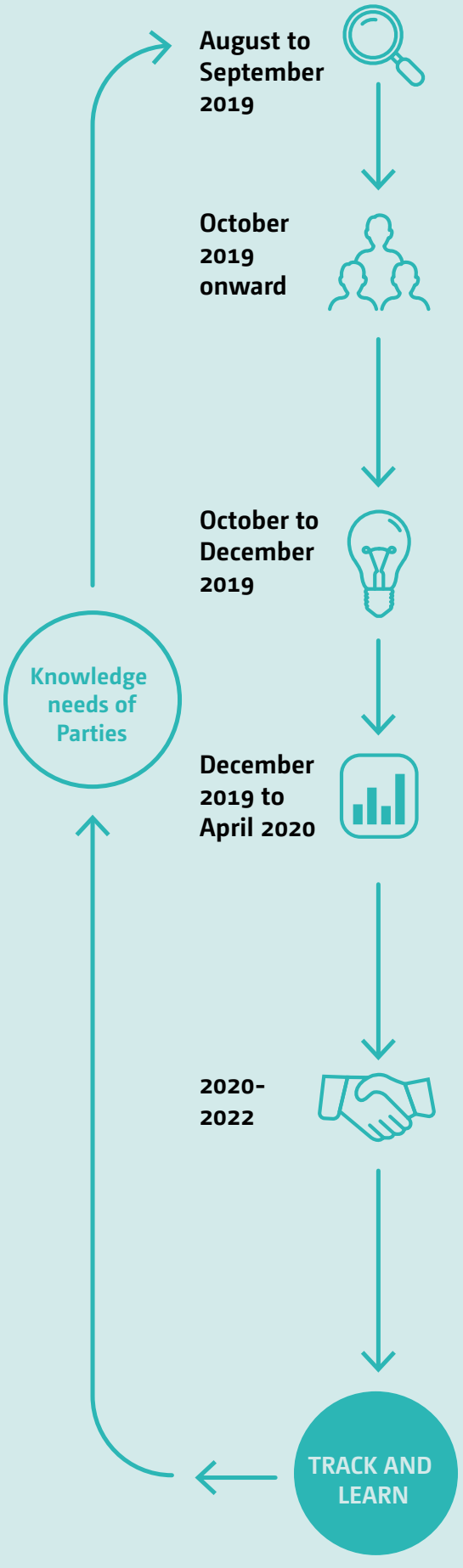


Figure 2: Oceans, Coastal Areas and Ecosystems: Overview of progress to date



Step 1: Scoping

- Development of a scoping paper that synthesizes existing knowledge on oceans, coastal areas and ecosystems, including mega deltas, coral reefs, mangroves and slow onset events

Step 2: Identify and engage with the expert group on oceans

- Establishment of an expert group on oceans consisting of around 23 representatives of renowned organizations and institutes, including the IPCC, United Nations agencies, networks and other relevant international organizations and institutes
- Collaboration with the expert group on oceans in subsequent steps

Steps 3 and 4: Refine knowledge & co-design actions

- Organization of the virtual meeting of the expert group in November 2019 with 12 experts, which led to refined knowledge gaps and indicative actions to address these gaps
- Organization of the 13th Focal Point Forum on oceans in collaboration with the expert group

Step 5: Report and disseminate findings

- Various knowledge outputs to share the scoping paper and outcomes of the Focal Point Forum (e.g. dedicated page on the UNFCCC website; UNFCCC Newsroom article; information booklet on the Forum)
- Synthesis report summarizing the outcomes of the scoping paper and the Forum in progress
- Policy brief on oceans

Step 6: Facilitate partnerships for action

- Organization of second virtual meeting (June 2020) and third virtual meeting of the expert group on oceans (May 2021) to discuss long-term partnership and collaborative actions
- Showcasing the progress of the work undertaken under the NWP in collaboration with the NWP expert group on oceans during the ocean and climate change dialogue in December 2020

Step 7: Implement actions (Parties and partners)

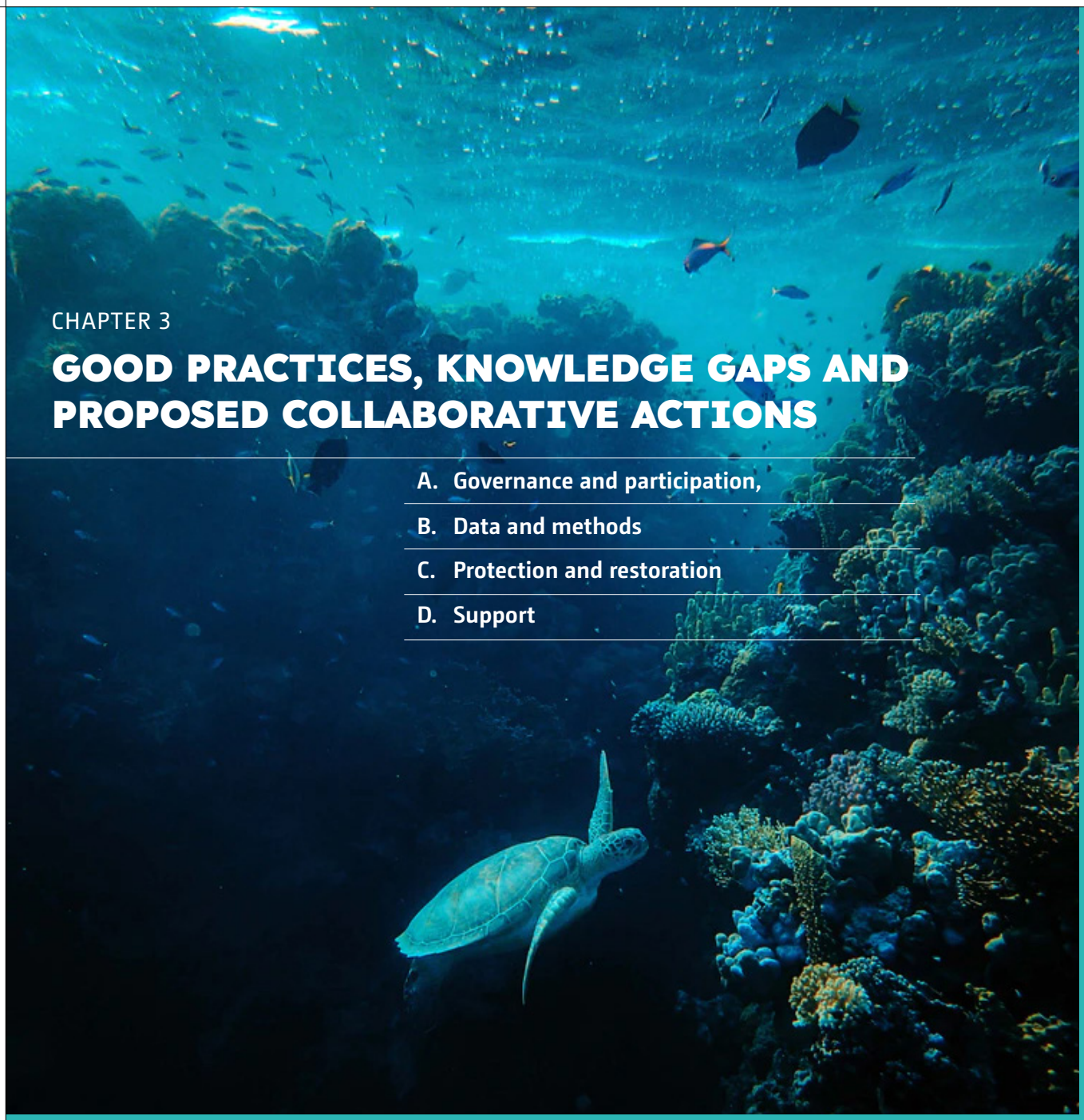
- Design and implementation of collaborative actions with the expert group (in progress)
- 14th Focal Point Forum on biodiversity and climate change to be held at COP26

BOX 1 NAIROBI WORK PROGRAMME EXPERT GROUP ON OCEANS

The thematic expert group on oceans comprises 23 representatives from renowned organizations and institutions, including the Intergovernmental Panel on Climate Change and other United Nations entities. It was set up on the basis of the following criteria: diversity of expertise on various subtopics relevant to the thematic area (e.g. mangroves, coastal areas and ecosystems, coastal communities, fisheries and aquaculture and slow onset events), regional and gender diversity, and diversity in terms of the geographical focus of the institutions represented.

The group has been responsible for:

- Providing feedback on the scoping paper identifying knowledge gaps and needs
- Refining knowledge gaps
- Participating at the expert meeting held before the 13th Nairobi work programme (NWP) Focal Point Forum on oceans
- Collaborating and leading discussion groups at the 13th NWP Focal Point Forum on oceans at COP 25
- Co-designing action for closing knowledge gaps and continuing engagement beyond the 13th NWP Focal Point Forum to align resources and adaptation action, and liaising with relevant organizations with a view to closing knowledge gaps.



CHAPTER 3

GOOD PRACTICES, KNOWLEDGE GAPS AND PROPOSED COLLABORATIVE ACTIONS

The focus of this chapter is to identify adaptation good practices and knowledge gaps, and the actions that could be undertaken to address these knowledge gaps. Knowledge gaps involve a number of topics that range from biophysical and socioeconomic issues to aspects of governance. On the basis of the work undertaken in these thematic areas, four main topics have emerged:

A. **Governance and participation**, which covers mainstreaming adaptation at all governance levels; developing strategies and legal frameworks; institutional strengthening, cross sectoral institutional coordination mechanisms; institutional linkages for coordination and information flows at the global, regional, subregional, national and local level; and participation mechanisms;

B. **Data and methods**, which covers data, information, methods, services and products for assessment, implementation and monitoring; and ecosystem-based methods for adaptation planning and implementation;

C. **Protection and restoration**, which covers coastal and marine ecosystem restoration; restoring corals, mudflats and tidal marshes; natural regeneration; and protecting healthy ecosystems and ensuring their sustainable management;

D. **Support**, which includes:

- Capacity-building and education, which covers capacity-building, ocean and climate literacy; environmental education; local-level adaptation; community-based participatory research; broad stakeholder engagement; and gender-responsive and socially inclusive approaches;
- Technology and innovation, which covers technology and innovation for preventing risks, sustainable planning and infrastructure;
- Finance, including blended financing, private investments and bankable projects.

The expert group identified various knowledge gaps and needs in the thematic areas of support, which were presented in the scoping paper. Some of these gaps and needs were addressed during the 13th NWP Focal Point Forum, which led to the co-design of collaborative actions. These specific knowledge gaps, needs and collaborative actions are presented under these four clusters in the next section.

A. Governance and participation

A.1 Overview of knowledge and good practices

The governance and participation cluster considered the following issues: actions to adapt to climate change in marine and coastal areas at the regional, national and subnational level; mechanisms for coordinated governance at the national level; engagement of civil society; regional, national and jurisdictional processes encompassing an ecosystem-based approach; and innovative methodologies for, and approaches to, marine and coastal management.

The following examples were identified:

Strategic actions to adapt to climate change in marine and coastal areas at the regional, national and subnational level

National authorities and regional bodies have considered the impacts of climate change and escalating socioeconomic costs on coastal areas, and climate adaptation has been a key consideration in many coastal management plans for over a decade. Regional fishery bodies have also identified climate change as a strategic theme to address.

The United Nations Environment Programme Regional Seas Programme has identified climate change as a strategic theme. Contracting Parties to the Barcelona Convention have adopted the Regional Climate Change Adaptation Framework for the Mediterranean Marine and Coastal Areas and the Caribbean Community developed its Regional Framework for Achieving Development Resilient to Climate Change for Caribbean SIDS.

The 10-year Strategic Action Programme for the Sustainable Management of Shared Living Marine Resources in the Caribbean and North Brazil Shelf Large Marine Ecosystems identifies impacts from climate change as a cross-cutting issue [5]. The Framework for Resilient Development in the Pacific is another regional initiative, focusing on SIDS in the Pacific.

At the subnational level, coastal adaptation launched by the Innovative Management for Europe's Changing Coastal Resource project provides coastal adaptation strategies that can be put into practice by coastal communities and economies [6]. The plan provides tools and methodologies for coastal adaptation strategies, local strategic adaptation guidance and advanced institutionalization of coastal adaptation. It has successfully enhanced capacity building.

Mechanisms for coordinated governance at the national level

Various countries have been developing their national plans for adaptation and for resilience-building. These include the

Mekong Delta Plan of Viet Nam [7], Enhancing Climate Change Adaptation in the North Coast and Nile Delta Regions in Egypt [8], the Belize Integrated Coastal Zone Management Plan (2016) [9]and the Seychelles Coastal Management Plan 2019–2024 [10].

Engagement of civil society at the national and subnational level

A number of countries are pursuing engagement with civil society on marine and coastal adaptation (see box 2).

BOX 2 EXAMPLES OF ENGAGEMENT OF CIVIL SOCIETY

- Saint Lucia has developed Civil Society Agendas in support of national policies to address climate change by civil society.
- The Sea'ties project launched by the Ocean & Climate Platform aims to identify and implement adaptation solutions and responses to climate change, on the basis of scientific synthesis, peer-to-peer learning and network sharing, in four regions (Europe, North and West Africa, West Coast of the United States of America and the South Pacific).
- Civil society has been engaged through workshops, including the Caribbean regional workshop on mobilizing indigenous and local knowledge solutions: addressing climate impacts and vulnerabilities, held from 3 to 5 September 2019 in Georgetown, Guyana, and the technical workshop on coastal vulnerability in Central Africa, held from 5 to 7 November 2019 in Libreville, Gabon, both organized by the United Nations Educational, Scientific and Cultural Organization.

Regional, national and jurisdictional processes encompassing an ecosystem-based approach

There are a number of examples of ecosystem-based approaches to jurisdictional processes at different levels which are implemented in pursuit of sustainable development and adaptive management (see box 3).

Integrated coastal zone management (ICZM) has been widely acknowledged as a way of managing the sustainable development and use of coastal and marine areas. It is also recognized in the FAO Code of Conduct for Responsible Fisheries. Extending this approach to national exclusive economic zones is a useful tool for supporting the planning and regulation of human activities within the marine environment. A number of contemporary ICZM plans and institutional frameworks (e.g. Belize's Coastal Zone Management Act, Coastal Zone Management Authority and Institute, and ICZM plan) serve to enhance climate adaptation by considering the long-term horizon and providing risk-informed decision-making. They also consider the costs and benefits of adaptation measures for adaptive planning and management.

BOX 3 APPROACHES FOR SUSTAINABLE DEVELOPMENT AND ADAPTIVE MANAGEMENT

Marine spatial planning is an operational approach to attaining sustainable development in national waters. A total of 75 countries have some form of spatial ocean management initiative in place, and marine spatial plans cover almost 15 per cent of the world's exclusive economic zones. A total of 20 countries have already implemented their marine spatial plans, and at least a third of the surface area of the world's exclusive economic zones is projected to be covered by government-approved marine spatial plans by 2030.[11] For example, the Seychelles has established coordination mechanisms across relevant national ministries, agencies and departments, with the participation of key subnational representatives to promote vertical as well as horizontal coordination and cooperation, and elevate the importance of ocean and coastal zone adaptation.

The ecoregional conservation planning currently under way for the Mesoamerican Reef is an example of multi-country, subregional marine spatial planning.[12]

Innovative methodologies for, and approaches to, marine and coastal management

Innovative methodologies have been developed to link regional, national and local approaches to climate change and coastal adaptation to influence policy-setting in relevant institutions and to strengthen policy as a driver in local settings. In addition to United Nations Environment Programme Regional Seas Programme linking action at different levels, several regional plans are being developed, such as the Regional Strategy and Action Plan for the Valuation, Protection and/or Restoration of Key Marine Habitats in the Wider Caribbean 2021–2030 [13]. The 10-year Strategic Action Programme for the Sustainable Management of the Shared Living Marine Resources of the Caribbean and North Brazil Shelf Large Marine Ecosystems focuses on addressing transboundary issues.

A.2 Knowledge gaps and needs

Knowledge gaps and needs identified are outlined in this section.

There is a need for more coordinated approaches and a combination of top-down and bottom-up approaches.

The complex nature of climate change poses unique challenges for institutions charged with mitigating and adapting to its impacts. This is particularly true for institutions at the local level in developing countries. Effective local adaptation requires responsive local governance. Constraints include weak technical and managerial capacity, poor linkages with other institutions at different levels (national, regional or global), lack of capacity and inadequate systems for gathering and disseminating data and information, and unclear mandates and conflicting priorities between levels and agencies of government [14]. The urgent needs that arise with climate change have contributed to uncoordinated projects which may have limited impacts and low long-term sustainability [15]. Recent papers [16] [17] and the outcomes of the first Marine Regions Forum 2019 under the Partnership for Regional Ocean Governance identify the need for a global coordinating mechanism to support global–regional–national institutional setups. A key area of analysis is the identification of the knowledge needed to inform institutional reforms, including lessons learned from existing initiatives.

Interactive governance that facilitates collaboration among public, private and civil society actors across sectors is needed to address the multidimensional impacts of climate change and the responses needed.

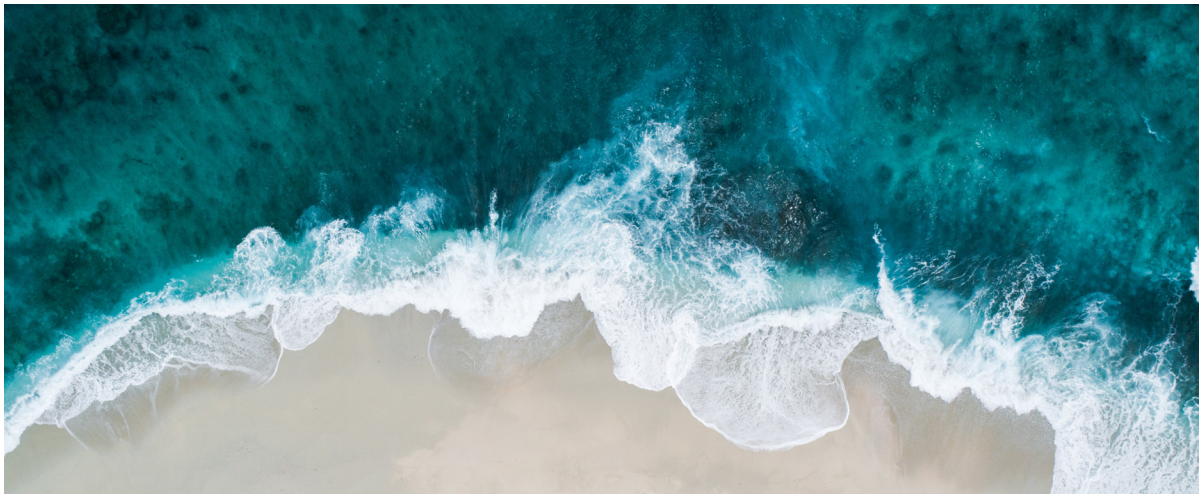
It is recognized that, in many regions, there is a lack of coherence and coordinated cooperation between scientists and policymakers when planning activities within scientific projects. Scientific outcomes are often disconnected from the activities planned by political authorities. It has been emphasized by UNESCO that indigenous and local practices of landscape and ecosystem management and accompanying knowledge systems can contribute substantially to boosting the coherence of governance and evidence-led decision-making.[18] Participatory research and intersectoral and transboundary cooperation can generate the holistic perspectives that are key to finding solutions and informing policy.

BOX 4 RECOMMENDATIONS TO FILL KNOWLEDGE GAPS AND NEEDS

ON GOVERNANCE AND PARTICIPATION

- Establish global coordinating mechanism which interlinks with other levels of action.
- Invite local champions to participate in and work with governments.
- Establish interactive governance mechanisms and public–private–civil society partnerships to address climate adaptation across sectors and at multiple levels.
- Strengthen institutions and build capacity, including in support of cross-sectoral, integrated governance mechanisms (including gender-responsive governance).
- Develop regulatory frameworks that support human rights-based and transparent participation, whereby all stakeholders understand the rights and duties in that context.

- Communicate scientific information in a way that is understandable to local communities, policymakers and project managers.
- Collaborate to address adaptation in the context of transboundary marine and coastal resources and issues, including coordination within SIDS.
- Engage indigenous and local knowledge holders in decision-making processes, including these groups as active partners and knowledge producers.
- Identify the most marginalized communities first (as they may require the most interventions and consultations).
- Map all relevant stakeholders at the planning stage of initiatives to ensure full participation.
- Engage communities and other stakeholders at all stages of the process, including design, planning, implementation, monitoring, evaluation and learning, and ensuring continuous feedback on decisions.
- Use innovative mechanisms for communication, exchange of knowledge and engagement of all key stakeholders both horizontally and vertically.
- Establish an ongoing adaptive system of monitoring outcomes and creating iterative feedback processes to ensure sustainable participation.
- Understand and bridge different mandates, agendas and nature-based solutions related to the issue of governance for adaptation in the context of the ocean.
- Establish a mechanism for coordinated interactive governance at different levels.



A.3 Actions to address knowledge gaps and needs

International, regional and local institutions, governments and other stakeholders all play a role in the process of implementing transformative actions for closing adaptation knowledge gaps. Various actions and steps by governments and stakeholders, including vertical linkages with actions at all levels of governance, are needed to address marine and coastal zone adaptation. The 2019 Blueprint for International Ocean-Climate Action: Goals and Steps for Governments and Stakeholders presents a set of near-term steps that governments and stakeholders could implement, as well as a set of medium-term and mid-century goals that they could adopt to create a thriving climate and ocean [19]. The Ocean for Climate report published by the Because the Ocean initiative also presents a set of ocean-related measures (both mitigation and adaptation) that can be included in climate strategies and states the importance of incorporating ocean action into NDCs, NAPs and adaptation communications.[20]

Box 5 below provides examples of actions proposed to help address adaptation-oriented knowledge gaps in the thematic area of governance and participation at different governance levels.

BOX 5 PROPOSED COLLABORATIVE ACTIONS IN THE CONTEXT OF THE NAIROBI WORK PROGRAMME

Map existing global agendas and mandates, including identifying synergies between different conventions and regulatory frameworks in relation to the topic of the ocean and climate change:

- Synthesize a list of relevant global ocean and climate change agendas building on the UN-Oceans Inventory of mandates and activities, and undertaking mapping with a focus on climate action in relation to the oceans, using existing mapping as a starting point;
- Raise awareness of actions occurring within other relevant conventions to reduce duplication and enhance understanding of ocean actions across conventions and promote collaboration and synergies;
- Create an inventory of existing initiatives and potential areas of collaboration, such as various multilateral agreements and conventions;
- Assess, document and share good practice to make use of different agendas and agreements in order to enhance knowledge of the tools that already exist, the relationship between them, and how synergies could be enhanced, for example by documenting all work on nature-based solutions for ocean and coastal governance issues;
- Design actions on the basis of the mapping exercise.

Share knowledge on coordinated participatory governance to identify best practices and recommendations, particularly regarding scaling out and scaling up institutionalizing policies and practices to strengthen enabling environments:

- Identify documented participatory processes under various conventions and the percentage of submissions from women and indigenous people; number of women and indigenous people in groups and committees, and authorships of reports. This action could be repeated through national-level consultations where corresponding data exist;
- Share and promote examples of harmonizing different global agendas on ocean and climate change adaptation to enhance participation at the regional and national level.

Share information on, and provide guidance for, science-based ocean solutions by consolidating existing principles, including best governance practices at all levels:

- Provide guidance that can be made available through the NWP;
- Strengthen linkages with existing relevant processes under and outside the Convention and the NWP. Share good practice databases and good examples of science-based ocean solutions;
- Address cross-cutting issues, including gender, human rights, youth engagement, livelihoods, use of indigenous and local knowledge, capacity-building and government ownership, finance and development (e.g. governance, adaptation communication and sharing knowledge with the general public), recognizing different cultures, the conditions in different countries and different vulnerability indices;
- Link existing initiatives and promote coherence, such as with the Subsidiary Body for Scientific and Technological Advice Earth Information Day;
- Expand outreach to cover partners and institutions who might not otherwise have adequate representation and participation in the United Nations Framework Convention on Climate Change (UNFCCC) process;
- Continue to work with UNFCCC ocean-climate issues as a way to strengthen action within the UNFCCC.

B. Data and methods

B.1 Overview of knowledge and good practices

The interaction between climate change and the ocean is complex and includes a cascade of biophysical and chemical changes. These can be understood better through high-resolution observation and modelling. Adaptation responses need an integrated approach consisting of different environmental drivers. Implementing guidance for the collection, sharing and reporting of marine information, such as using the SDG 14.3.1 indicator methodology as good practice, is needed in order to improve global, regional and local predictions of ocean acidification and the impacts of climate change. It is also important to foster and coordinate ambitious international ocean science data programmes, as proposed through the United Nations Decade of Ocean Science for Sustainable Development (2021–2030), and to promote specific cooperation schemes.

Some of the innovations and best practices being undertaken are listed below.

Integrated and sustained ocean observation, new partnerships, participatory tools and methods

New partnerships are envisaged under the Global Ocean Observing System 2030 Strategy to provide an integrated global system that can deliver data and information that support not only operational services, but also climate change adaptation and resilience-building.

A specific example is the integrated sea level monitoring system of the Global Sea Level Observing System, which uses different types of data, sources, and time and space scales to provide a sea level information system that handles data from different observation networks.

The World Ocean Council has developed the Smart Ocean/Smart Industries programme to expand and improve industry involvement in data collection and sharing to better understand the ocean, improve safety and reduce environmental impacts.

Development and application of participatory information technology tools and methods to document indigenous and local knowledge of coastal communities.

These tools help to develop community adaptation plans, build resilience in small-scale fisheries and local blue enterprises. For example, Dominica, Fiji, Grenada, Samoa, Tonga, and Trinidad and Tobago have used participatory 3D modelling to plan coastal adaptation.

B.2 Knowledge gaps and needs

Knowledge gaps and needs range from the availability of, and access to, data, information, tools and methods for forecasting marine weather extremes, to knowledge of the adaptive capacity of ecosystems, such as mangroves and corals and societies. There are two main challenges:

- A collective lack of data on many ocean variables (owing to relatively poor scope and geographical coverage and few or limited time series for many variables), particularly those with the granularity required for predictive models to work well in various regions of the world;

- A large imbalance between the limited number of stakeholders that have the means and resources to collect and manage data (including ocean-based industrial players) and the rest of the international community.

Developing an ability to provide relevant information at the global, regional, local and coastal level is vital to addressing local needs and adaptation

This specifically includes developing better understanding and knowledge of key variables, such as coral, seagrasses, macroalgae, and mangrove cover composition and coverage. Improved information will help resolve scientific issues and address societal needs, manage marine resources and support climate change adaptation. Standardized and robust baseline ecosystem risk assessments are required to analyse and compare the status of conservation of marine and coastal ecosystems across regions as

well as identify major environmental and human-driven threats (e.g. the IUCN Red List of Ecosystems).

Responding to the combined effect and impact of climate change and events not related to climate

Improved knowledge and understanding as to how harmful algae bloom and climate change stressors interact and affect aquatic life in marine and freshwater ecosystems are needed in order to formulate management and adaption plans that protect human health, fisheries and aquaculture in many ocean countries. Local-scale modelling and forecasting of extreme events (in particular, understanding the biological interaction between the atmosphere and the ocean) remain a challenge.

Understanding ocean acidification processes and potential biological feedbacks on ocean chemistry

An improved understanding of ocean acidification processes and biological feedbacks requires transdisciplinary cooperation between the sciences, indigenous and local knowledge, and decision-makers.

BOX 6 RECOMMENDATIONS TO FILL KNOWLEDGE GAPS AND NEEDS

ON DATA CONTENT

- Fill gaps in relation to data and information for reliable forecasts and assessments on climate change impacts that hinder the preparation of ocean-related adaptation plans.
- Fill gaps on ocean data and information for coastal areas and exclusive economic zones, particularly with regard to marine ecosystem health and climate change adaptation.
- Fill data gaps regarding the deep ocean, beyond exclusive economic and coastal zones, which are important for research and management.
- Understand how harmful algae bloom and climate change stressors interact and affect aquatic life in marine and freshwater ecosystems.
- Provide relevant socioeconomic data needed for adaptation, including adaptive capacity, and provide socioeconomic data at levels comparable to biophysical data to enable joint assessments and studies.
- Define and differentiate between loss and damage induced by climate change from that of other natural causes, and gain understanding of the long-term impacts on livelihoods, food security, businesses and well-being.
- Recognize indigenous and local knowledge alongside scientific knowledge and integrate it into decision-making systems

BOX 7 RECOMMENDATIONS TO FILL KNOWLEDGE GAPS AND NEEDS

ON DATA SHARING AND UTILIZATION

- Develop uniform policy outlining climate change related data-sharing and utilization guidelines.
- Share knowledge and scale up participatory methods for vulnerability risk assessments, adaptation planning and monitoring effectiveness.
- Ensure that ocean and climate research data are easy to find, accessible, interoperable and reusable.
- Demonstrate the value of the data and make connections between different sets of socioeconomic data.
- Generate data to increase technical capacities of countries globally.
- Provide better coordination of all platforms and systems storing and providing data, and ensure complementarity. For example, establish a responsible body and/or online knowledge management system to coordinate data collection.
- Enable interested communities to have a stake in the data and data collection so that they can be engaged in adaptation actions. In this light, more simple participatory methods are needed to help communities understand the problem and challenges.
- Integrate participatory research and citizen scientific data to complement scientific research through mechanisms, tools and collaborations.
- Strengthen national statistical systems and institutions.
- Familiarize countries with data collection and data collection frameworks, for example the essential ocean variables.
- Ensure accessibility and utilization of data to help policymakers make informed decisions and countries implement policies: this could include packaging and representing data in a userfriendly way or enhancing capacity-building for integrating data into policies at all levels.

Proposed collaborative actions to address gaps and needs

During the 13th NWP Focal Point Forum, participants identified the need to institutionalize the data collection process and the need for data processing, monitoring, sharing and reporting. In terms of institutionalizing the data, IOC-UNESCO and other United Nations bodies are identified as having an important role to play. A range of data is needed for adaptation to climate change in the ocean and coastal zones, and these data need to be measured

and collected by a range of platforms and networks. Lack of socioeconomic data can also hamper integrated assessments. It was also emphasized that lack of data should not be an excuse for lack of action. Challenges include obtaining data, owing to a lack of coherent global governance, maintaining long-term data series and ensuring open access to data.

Examples of actions proposed to help address adaptation-orientated knowledge gaps in the thematic area of data and methods are provided in box 8 below.

BOX 8 COLLABORATIVE ACTIONS UNDER THE NAIROBI WORK PROGRAMME

Ensure accessibility and applicability of robust data (particularly for SIDS, LDCs and African countries), including by providing access to collected data; packaging and presenting data in user-friendly formats; enhancing capacity-building for data analysis and data integration at different levels; and developing products and services.

Increase capacity:

- Increase capacities of countries to generate data around the world;
- Enhance capacity-building for data analysis and developing products and services;
- Enhance capacity-building for integrating relevant, robust data and information into policies at all levels.

Package and present (content):

- Make use of existing technologies to organize data sets, for example, cloud technology;
- Package and present data in user-friendly formats;
- Co-produce data that can be presented in different ways, asking users the type of format is needed;
- Enhance ownership of data and data analytics between the public and private sectors.

Monitor and evaluate:

- Develop long-term data collection policies;
- Ensure data monitoring, reporting and verification, and establishment of data governance and management systems.

Help communities and policymakers understand which data are available and where there are gaps (including gaps in data standardization and the need for long-term monitoring) at both the local and national level, as well as empowering communities to gather data in addition to enhancing capacity for national government reporting using the data mentioned above.

The following collaborative actions were identified:

- Facilitate the availability of, and access to, data for policymaking;
- Develop a feedback system to identify more users of the data, so that the data can be used by different stakeholders, and consider reaching out to local communities and stakeholders (as achieved by the project of the Climate and Ocean Support Program for the Pacific [20] that empowers communities to document their traditional knowledge in conjunction with climate science data);
- Build capacity and provide training on data collection tool use for communities, policymakers and other stakeholders.

C. Protection and restoration

C.1 Knowledge and good practices

This thematic cluster considers the protection of healthy ecosystems, restoration of coastal and marine ecosystems, corals, mudflats, tidal marshes and natural regeneration, and encouraging sustainable management and use.

Coastal and marine ecosystems reduce the risk to people, infrastructure and economic activities from erosion and flooding by storm surges, tsunamis and sea level rises, for example by attenuating wave energy. An integrated planning approach for coastal zones and marine areas, utilizing the ecosystem services that healthy coastal ecosystems can provide, improves livelihoods, helps to mitigate the impacts of disasters and enhances climate resilience.

Examples of innovations and best practices are addressed below.

Nature-based solutions offer cost-effective solutions for adaptation that build resilience to a range of climate change impacts and provide significant co-benefits for people and biodiversity and are increasingly prominent across international frameworks for addressing societal challenges, particularly in developing countries.

Nature-based solutions for climate change adaptation involve the conservation, sustainable management and restoration of natural or modified ecosystems to help societies adapt to climate change, such as restoring mangrove forests or conserving coastal wetlands. They are often implemented in a holistic, landscape-scale approach that recognizes the benefits of interventions from indigenous peoples and local communities as well as conservation benefits, while recognizing local and customary rights and access to resources.

Coastal and marine ecosystem management plans consider the importance of integrating a long-term planning horizon as well as cost-effective adaptation measures such as nature-based solutions.

About 70 per cent of the 161 NDCs submitted in 2016 referred to marine issues, which were most frequently components of adaptation actions or related to climate impacts. Over a third of the NDCs submitted also included ocean-related mitigation measures, largely relying on blue carbon ecosystems absorbing carbon dioxide and storing carbon in sediments (i.e. mangroves, saltmarshes and seagrasses).

The 2019 Global Assessment Report on Biodiversity and Ecosystem Services by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

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highlighted good practices that can lead, for example, to sustainable management and restoration of marine ecosystems. [22]

Blue carbon is an important consideration in management. Blue carbon ecosystems, including mangroves, salt marshes and seagrass meadows, are found in every continent except Antarctica. These ecosystems must meet a range of criteria, mainly regarding consistent carbon accounting, before being considered for their climate mitigation value in international and national policy frameworks.[23]

Conservation and sustainable management of mangrove forests in conjunction with restoration and natural regeneration would halt the loss of these ecosystems and ensure ecosystem functionality for climate adaptation and mitigation.

There are many restoration initiatives in progress, including youth and community-led conservation efforts and local coral reef and mangrove restoration initiatives. Examples include mangrove reforestation in Can Gio, southern Viet Nam, mangrove planting projects in northern Viet Nam; coral reef restoration in Grenada; the Mangrove Market Women initiative in Papua New Guinea; the Commonwealth Blue Charter Action Group on Mangrove Restoration led by Sri Lanka, and various Ridge to Reef programmes in Raja Ampat, Indonesia and Fiji. Ambitious global initiatives include the Resilient Reefs initiative of the Great Barrier Reef Foundation which aims to develop and pilot an innovative model for resilience-based reef management in five marine UNESCO World Heritage Sites, including the Belize Barrier Reef Reserve System.

See box 9 below for examples of partnerships and initiatives dedicated to addressing challenges related to restoration and protection.

BOX 9 EXAMPLES OF PARTNERSHIPS AND INITIATIVES RELATED TO RESTORATION AND PROTECTION

- The Global Mangrove Alliance is a partnership of intergovernmental organizations, non-governmental organizations, governments and local communities working towards the common goal of halting mangrove degradation and expanding mangrove habitat by 20 per cent by 2030.[24]
- The Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security is a multilateral partnership between Indonesia, Malaysia, Papua New Guinea, the Philippines, Solomon Islands and Timor-Leste to sustain extraordinary marine and coastal resources by addressing crucial issues such as food security, climate change and marine biodiversity.[25]
- The International Partnership for Blue Carbon is a government-led partnership that seeks to protect and conserve coastal blue carbon ecosystems for climate change mitigation and adaptation.[26]

Technologies that aim to build resilience of the natural system and coastal communities.

Technologies for resilience include traditional engineered solutions, nature-based solutions, hybrid technologies and non-structural (e.g. legal and regulatory) solutions, which can be in synergy with cross-sectoral planning and management approaches to integrated coastal and marine adaptation.[27] Greater

emphasis is now being placed on the potential for nature-based solutions to form part of hybrid solutions, which are landscape approaches that combine conservation, restoration and sustainable management with traditional or engineered approaches.

Hybrid nature-based solutions challenge siloed, sector-specific approaches, and encourage stronger integration by bringing together multisectoral actors in biodiversity, engineering, landscape planning, communities and governmental agencies.

Global standards are being developed for nature-based solutions, such as the IUCN Global Standard for nature-based solutions, which emphasizes that these solutions are designed to be climate-resilient and take uncertainties in climate predictions into account. The Global Standard includes a criterion that addresses the way solutions are designed at a sea or landscape level which involves investigating and considering synergies with other types of solutions.

Importance of marine protected areas

Marine protected areas in many parts of the world are vital to protecting the ocean and contributing to adaptation. There are increasing calls, with scientific backing, for 30 per cent of the ocean to be designated as marine protected areas by 2030. For example, the Government of the Seychelles, an archipelago in the Indian Ocean, has committed to protecting 400,000 km² of marine area, equating to about 30 per cent of its waters.

C.2 Knowledge gaps and needs

Knowledge gaps include the need for both capacity-building and improved technical practices in site and species selection, integrated coastal planning, and long-term monitoring and maintenance, coupled with better protection and governance of mature mangrove forests and other vegetated coastal ecosystems. Mapping loss and distribution of coastal ecosystems is also an important area required for effective planning, management and restoration.

Increased knowledge is required regarding the role that mangroves and seagrasses play in buffering the impacts of ocean acidification.

Greater involvement of indigenous peoples, local communities, youth and women, including in participatory processes, is essential for successful and equitable outcomes. This should incorporate indigenous and local knowledge into restoration efforts and ensure equitable distribution of benefits.

BOX 10 RECOMMENDATIONS TO FILL KNOWLEDGE GAPS AND NEEDS

ON PROTECTION AND RESTORATION

- Develop accurate and detailed maps of the extent, health and use of all types of coastal ecosystems (e.g. seagrasses). This should include participatory mapping by indigenous peoples and local communities.
- Build knowledge of the current capacity of coastal and marine ecosystems to adapt and cope with climate and non-climate impacts.
- Continue research into how nature-based solutions and hybrid adaptation strategies can help reduce climate risks and impacts in coastal areas, including sudden and slow onset events and other climate risks.
- Promote understanding of the role of mangroves and seagrass in buffering the impacts of ocean acidification.

- Increase actions to reduce the rate of mangrove degradation and halt historic habitat loss.
- Implement and develop measures for assessing the effectiveness of ecosystem-based adaptation actions in marine and coastal ecosystems.
- Strengthen institutional arrangements, laws and policies for restoration.
- Make relevant information available and accessible, and build capacity to assess mitigation co-benefits of coastal ecosystems (blue carbon ecosystems: seagrasses, salt marshes and mangrove forests).
- Make relevant knowledge accessible and build capacity and expertise, including guidelines on methods and good practice.
- Involve indigenous peoples, local communities, youth and women; and integrate indigenous and local knowledge in restoration efforts and benefit distribution, recognizing tenure and access rights.
- Increase adaptation knowledge, expertise and practice for protection and management of oceans beyond the coastal zone.
- Enhance synergies and avoid duplication of work (e.g. work in collaboration with the Marrakech Partnership for Global Climate Action and UN Decade on Ecosystem Restoration).
- Address capacity needs and knowledge gaps related to integration of mitigation strategies into coastal and marine infrastructure in a way that avoids negative impacts on biodiversity and ecosystems.
- Establish a common taxonomy with regards to ecosystem protection, climate and biodiversity (currently a challenge faced in the Convention on Biological Diversity and the UNFCCC).
- Monitor activities undertaken across divergent protocols and methodologies (e.g. regional guidelines for mangrove and seagrass restoration being developed by UNEP).
- Gather local examples on ocean management of transitioning ecosystems as already in place for terrestrial ecosystems.
- Encourage the collection and analysis of ecological data through citizen science and by volunteers as part of scientific enquiries. This will give citizens an opportunity to contribute to both the scientific and the societal goals of ecological restoration.
- Increase knowledge on protection and conservation in deep sea and high sea areas, particularly regarding climate adaptation and resilience.

C.3 Proposed collaborative actions to address gaps and needs

During the 13th NWP Focal Point Forum, participants highlighted that biological scales differed from political boundaries, especially in the case of ocean ecosystems. Several collaborative actions were identified.

Examples of actions proposed to help address adaptation-oriented knowledge gaps in the thematic area of protection and restoration are provided in box 11 below.

BOX 11 COLLABORATIVE ACTIONS UNDER THE NAIROBI WORK PROGRAMME

1. Raise awareness of existing maps showing the scope of coastal and marine ecosystems and identifying gaps where more robust mapping is needed in order to understand risks (e.g. land-use changes and development pressures) and priorities for restoration and conservation actions.

2. Complement new and emerging work taking place in the conservation technology space:

    - Ensure efficiency, map activities and identify differences to minimize duplication of work;

    - Understand and promote links between different areas, such as action taking place in areas outside national jurisdictions and action on coastal management across exclusive economic zone lines.

3. Develop and promote existing materials on nature-based solutions as part of a multi-pronged or hybrid approach and key messages that are highlighted in reports such as the Intergovernmental Panel on Climate Change (IPCC) Special Report on the Ocean and Cryosphere in a Changing Climate and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) 2019 Global Assessment Report on Biodiversity and Ecosystem Services, with a special emphasis on linkages with mitigation co-benefits:

    - Use a narrative, such as nature-based solutions, as part of a multi-pronged or hybrid approach;

    - Link to mitigation co-benefits;

    - Use key messages that are highlighted in reports such as the IPCC Special Report and IPBES Assessment Report.

4. Broaden areas of operation for an integrated approach to restoration:

    - Map out resources and use them to disseminate information or promote synergy between different initiatives;

- Carry out assessments to create and design demand-driven solutions (different level of engagement, including countries and subregions);
- Play a role in facilitating the involvement of non-governmental organizations such as Conservation International, WWF and the International Union for the Conservation of Nature, strengthening linkages with organizations under the Convention on Biological Diversity process and the UNFCCC Local Communities and Indigenous Peoples Platform;
- Play a facilitative role in bringing together new actors such as research centers and universities and build synergies with the engineering community;
- Share information on the Nairobi work programme Adaptation Knowledge Portal. For example, the University of Queensland has identified potentially resilient reefs to guide restoration projects. (This specific action could also be relevant in terms of sharing information on other topics.)

D. Support

D.1 Knowledge and good practices

This cluster considers the following areas:

- **Technology and innovation:** technologies and innovation for preventing risks and promoting sustainable planning and infrastructure, and technologies and innovations for supporting improved ocean governance and adaptation;
- **Finance and funding**: various funding and financing tools, public and other, including blended financing, private investments and bankable projects;
- **Participatory research, capacity-building, engagement and communication:** ocean and climate literacy, environmental awareness and education, local level adaptation, community-based participatory research, broad stakeholder engagement, gender-responsive and socially inclusive approaches, and awareness-raising.

Community-based approaches are important participatory approaches in coastal areas and are being implemented in conjunction with ecosystem-based approaches.

Participatory tools have been developed to facilitate ecological and social vulnerability risk assessments and local adaptation planning and action. In the Caribbean, for example, community-based approaches led by civil society and resource users such as fishers and community microenterprises are initiating adaptation innovations and building resilience in coastal ecosystems and community livelihoods (see box 12).

BOX 12 LOCALLY MANAGED MARINE AREA NETWORK

The Locally Managed Marine Area Network is a group of practitioners involved in various community-based marine conservation projects around the globe, primarily in the Indo-Pacific, who have joined together to learn how to improve management efforts. Through this Network, coastal communities are reviving methods that have been used as part of their culture for many generations, sometimes blending them with modern techniques for optimal results.

Enhancing linkages between the ocean and climate adaptation frameworks.

Building linkages and synergies is important in order to bring together ocean and climate change professionals and enable them to identify and use relevant management tools, as well as develop and implement any necessary governance frameworks. The Galápagos Alliance, the Caribbean Natural Resources Institute and the Reef Resilience Network are examples of regional capacity-building and educational organizations and networks. Capacity-building through a combination of targeted methods, such as training for trainers, mentoring, coaching, action learning, communities of practice and peer exchanges, is effective at building knowledge and fostering change on the ground.

Technology coupled with innovation can support improved ocean governance and adaptation.

There is a high interest in applying a range of technologies for commercial purposes and for gaining a better understanding of marine ecosystems and the requirements for their better management.[28]

The management of ports is being changed completely by new monitoring technologies and information systems, such as those developed under the United Nations Conference on Trade and Development.[29]

Technology can provide information on illegal fishing but this must be coupled with appropriate enforcement systems.

Recent innovative solutions consider sustainable use of ocean resources and application of sustainable management plans for coastal areas.

National and regional funds are important channels of funding to civil society, local communities and governments.

Funds for marine and coastal adaptation include the Mesoamerican Reef Fund, the Caribbean Sea Innovation Fund, the Caribbean Biodiversity Fund and its Ecosystem-based Adaptation Facility.

There are also other national, regional and international types of finance and funding instruments. Although not specifically for oceans, these are useful sources of funding. The World Bank Group, Global Environment Facility, Asian Development Bank, European Regional Development Fund, African Development Bank, Caribbean Development Bank and other international donors fund climate adaptation and resilience efforts in developing countries and regions that contribute to generating adaptation knowledge. International climate finance is being scaled up by climate funds focusing on adaptation, including the Green Climate Fund, the Adaptation Fund and the Special Climate Change Fund. These funds serve as an additional source of funding to support developing countries in achieving a shift towards low-emission and climate-resilient pathways.

Emerging innovative financing instruments for adaptation and, specifically, ecosystem-based adaptation within the insurance sector provide new opportunities.

The InsuResilience Global Partnership reports that the insurance industry could invest in ecosystem-based adaptation, where (re)insurers invest in social impact bonds or green bonds that include actions to conserve and restore ecosystems for their financial returns and their benefits to society (see box 13 on blue bonds).

The Caribbean Catastrophe Risk Insurance Facility is an innovative regional fund allowing countries to purchase parametric insurance to cover extreme weather events, which are escalating owing to climate change. This also includes coverage for the fisheries sector. Governments in Saint Lucia and Grenada have purchased coverage for small-scale fishers. Supporting initiatives led by civil society, indigenous peoples and local communities through global funds (e.g. Green Climate Fund and Adaptation Fund) is also important.

BOX 13 BLUE BONDS

Blue bonds are considered to be an innovative finance mechanism and an important blended finance instrument. Blue bonds can provide countries with resources for improving fishery and coral reef management and facilitating ecosystem-based adaptation to climate change in a holistic fashion. Examples of national and subnational financing include debt restructuring in the Seychelles and Mexico's Yucatan peninsula and the innovative financing scheme for coral reef insurance of the Coastal Zone Management Trust.

New facilities have also emerged, such as the Blue Natural Capital Financing Facility, which provides funding for bankable projects and businesses with clear climate change adaptation and mitigation impacts that include nature-based solutions in coastal areas. The goal is to leverage private investment opportunities into sustainable climate projects that build on or include nature-based solutions, as they are still very rare.

The concept of a blue economy is being increasingly used, including in Pacific and Caribbean SIDS, to explore the potential for enhancing economic development in these large ocean states on the basis of the sustainable use of marine and coastal resources.

Recent dialogues at the Blue Economy Caribbean 2019 event hosted by the Caribbean Development Bank emphasized the need for inclusive blue economy approaches that provide equitable economic benefits to poor and vulnerable coastal communities and recognized that economic development must also enhance resilience to climate change and natural hazards. Commitment to transformative actions for sustainable blue economies is gaining traction at the regional, subregional and national level in Africa. The African Union Commission has proclaimed the blue economy as the "New Frontier of an African Renaissance" and, in 2014, adopted Africa's Integrated Maritime Strategy 2050, which identified the development of a blue economy as the engine of growth, capable of driving industrialization, alleviating poverty, increasing food security and creating job opportunities on the continent. [30]

Building resilience in the fisheries sector to address food security concerns.

The restoration, conservation and sustainable use and management of coastal ecosystems can provide benefits to fisheries, as many coastal ecosystems act as nurseries for key fishing stocks. These benefits have also promoted food security and community resilience in the face of the global coronavirus disease 2019 pandemic.

The FAO is implementing global and regional adaptation projects funded by bilateral donors and the Global Environment Facility to address the vulnerability of small-scale fisheries and build resilience to slow and rapid onset climate events. One example is the Climate Change Adaptation of the Eastern Caribbean Fisheries Sector Project, which aims to address vulnerability in the small-scale fisheries sector.

Belize is strengthening its capacity to quantify, monitor and interpret the impacts of climate change and human activities on key commercial fisheries and reef ecosystems.

The Caribbean Natural Resources Institute has developed a methodology to help 'local blue' microenterprises and small community enterprises (e.g. in community ecotourism, small-scale fisheries and agroprocessing) to assess vulnerabilities along their value chains and to implement adaptation measures.

D.2 Knowledge gaps and needs

This thematic cluster identified the need for:

- Long-term vision and innovation, embracing system-wide thinking and social inclusiveness as the 'new normal';
- Systems-based, intersectional and multidisciplinary training.

Capacity-building needs to expand beyond technical needs and focus on strengthening the public sector, civil society, community and women's groups, and informal networks of people.

There is a need to formulate and implement integrated, cross-sectoral and coordinated approaches to the management of marine and coastal areas. Such plans will need to focus on adaptation priorities, support the science–policy interface, and integrate the implementation of relevant SDG targets.

The need to translate knowledge of the scientific and planning communities into the local context, and to translate local and traditional knowledge for use by policymakers and creating opportunities for genuine dialogue between all stakeholders.

Effective participation is only possible when communities are well acquainted with the dangers they face and can effectively share how these impact their lives and livelihoods. Communities also need to be represented in the planning process and involved in creating their own solutions appropriate to their local context and needs.

The formulation and implementation of integrated, cross-sectoral and coordinated approaches to the management of marine and coastal areas

Effective communication of knowledge to influence policy and practice is critical, and needs to target all levels and sectors, from global negotiators and multinational companies to key sectors impacted by climate change and community resource users, such as fishers, whose livelihoods are highly vulnerable.

Planning will need to focus on adaptation priorities, fully support the science–policy interface and integrate the implementation of the SDG 13 and SDG 14 targets.

Adaptation knowledge gaps also exist owing to a lack of human and technical capacity and resources in many regions, particularly in the global South, SIDS and the LDCs.

Participation in training organized by IOC-UNESCO, the Partnership for Observation of the Global Ocean, the Ocean Acidification International Coordination Centre of the International Atomic Energy Agency, the Global Ocean Acidification Observing Network and non-governmental organizations is high, but still only reaches a small proportion of stakeholders; the majority of training and educational efforts should focus on bringing technical capacity to the most vulnerable areas. The Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs of the United Nations, is also addressing various aspects of these capacity needs, but these activities could be enhanced through collaborative efforts among United Nations agencies and other stakeholders.

Local communities and microenterprises need access to appropriate technologies (such as the small-scale solar technology used by communities in Trinidad and Tobago) and support to innovate. Furthermore, those women and men engaged in microenterprises need appropriate knowledge on business management, maintenance and bookkeeping to ensure innovation is long-term and accessible to all members of the community. For example, mariculture innovation by a community enterprise in Mayreau in Saint Vincent and the Grenadines is enhancing the resilience of the edible algae it farms to increased wave action caused by stronger storms, and support is needed to scale this out across the Caribbean. In Sri Lanka, conservation efforts are strengthened with livelihood development and capacity-building for mangrove-based livelihoods, involving communities, local government, national authorities and the private sector, with support from SLYCAN Trust.

Long-term, consistent financial support

The mobilization of national public funding to support integrated policies is often a challenge in many countries. This challenge also concerns awareness and application of innovative financial tools for adaptation. An analysis of the relative importance of different types of climate finance is needed that considers the focus on adaptation knowledge and, where relevant, on ocean adaptation measures. Funding constraints are one of the most pressing challenges in reaching global climate targets that build on nature-based solutions.

BOX 14 RECOMMENDATIONS TO FILL KNOWLEDGE GAPS AND NEEDS

ON CAPACITY-BUILDING AND COOPERATION

- Building capacity to understand hazards and risks associated with climate change, ocean acidification, sea-level rise and other sources, including with respect to gender-differentiated impacts and risks.
- Enhancing community-based participatory research into local effects of climate change and adaptation challenges, including on the human displacement and the impact on their livelihoods.
- Refining and reducing carbon footprints of new ocean and marine technologies.
- Strengthening recognition of indigenous and local knowledge in small island developing States and enhanced transdisciplinary collaboration between all actors, including scientists, indigenous and local knowledge-holders and policymakers.
- Providing long-term, consistent financial support for local civil society, indigenous peoples and local communities, such as microfinance and innovative mechanisms.
- Facilitating construction of, and participation in, knowledge networks that can connect technical expertise to local challenges (such as women's groups and organizations).
- Collecting best practice for the substantive, not merely formal, involvement of women, men, youth and indigenous peoples in adaptation actions and strategies.
- Developing sound strategies for coordinated climate change awareness and education programmes, especially in the least developed countries, small island developing States and African countries.
- Supporting cooperation for, and access to, technology for forecasting marine weather and climate extremes and the resulting hydrological risks, forecasting storm surges and tsunamis and modelling integrated and combined coastal vulnerability and its impacts.
- Integrating ecosystem-based adaptation considerations into the insurance industry.
- Understanding of potential impacts of technologies on ocean and coastal ecosystems.
- Establishing channels for regularized technological learning/exchanges across domains of marine and coastal practice.
- Understanding risks and uncertainties of technological developments, such as risks to local livelihoods.

- Promoting social and action learning approaches that encourage dialogue and behaviour change and foster collaboration, resulting in sustainable outcomes.
- Supporting local innovation and use of technologies by communities and micro-enterprises.
- Integrating ecosystem-based adaptation considerations into the insurance industry and other innovative financing mechanisms.
- Undertaking research on linkages between restoration practice and ocean science.
- Promoting genuine multi-stakeholder engagement, including involving relevant sectors such as the transport sector.
- Creating platforms of dialogues between indigenous knowledge holders, scientific communities and policymakers for effective co-production of knowledge that supports decision-making and coastal and marine co-management practices.
- Exploring opportunities for science ministers and councils to work together.
- Mobilizing graduate students and local academic institutions to support research and build knowledge bases and in-country capacity through new projects, translating knowledge between communities and experts.

Actions to address gaps and needs

Given the disconnect between fresh water and oceans (upstream versus downstream), it was recommended that a dialogue be convened between communities of practice and different knowledge communities to encourage holistic thinking. There is an opportunity to share strategies on multi-stakeholder participation in both the United Nations Decade of Ocean Science for Sustainable Development (2021–2030) and the United Nations Decade on Ecosystem Restoration (2021–2030). The working group recommended that the two Decades could have a shared indicator on mobilizing indigenous and local knowledge systems in the marine and coastal environment within their multi-stakeholder target.

Examples of actions proposed to help address adaptation-oriented knowledge gaps in the thematic area of protection and restoration are provided in box 15 below.

BOX 15 COLLABORATIVE ACTIONS TO BE UNDERTAKEN UNDER THE NAIROBI WORK PROGRAMME

1. Use universities as bridges into new projects, translating knowledge between communities and experts.

2. Develop a technical paper on best practices for systems-based participatory training and communication of knowledge.

3. Convene a dialogue between different knowledge communities, such as those working on upstream freshwater ecosystems and those working on ocean ecosystems, to achieve holistic thinking in addressing the topic of ocean, coastal and ecosystem areas.

4. Develop actions that ensure a systematic approach to capacity-building that lead to substantive engagement of stakeholders in collaboration with relevant processes under and outside the Convention.

   These could consider the following:

   - Targeting capacity-building on the basis of assessments of priority needs and subject to evaluation;

   - Focusing on building capacity, of vulnerable stakeholders and those who need to engage with them in particular, and an enabling environment, through, for example, suitable policies. This could connect to the Capacity-building Hub organized by the Paris Committee on Capacity-building;

   - Capacity-building that goes beyond training: there is a need to use innovative and participatory methodologies that are effective at building knowledge and skills, and supporting practical application with different target audiences.

5. Promote tools, technologies and knowledge that are available for adaptation options: Map tools and technologies, for example, for restoration, provide a list of technologies and ensure that tools are available for awareness.

6. Ensure compliance with existing frameworks, such as the United Nations Convention on the Law of the Sea, and address questions of ethics in capacity-building and the transfer of marine technology. This could also involve developing a best practice guide and code of ethics helping experts working in frontline communities to build substantive partnerships with community members without engaging in extractive science.

7. Raise awareness of financing opportunities for the ocean/climate nexus (marine and coastal ecosystems), leveraging synergies, and sharing, disseminating and packaging knowledge and lessons learned (e.g. information about selected options, such as reinsurance or blue bonds). The following could be considered:

   - Organizing a session on the Nairobi work programme (NWP), focusing on nature-based solutions.

8. Develop recommendations for the Green Climate Fund (GCF) and the Adaptation Fund (AF) on considerations of ecosystem-based adaptation programmes for ocean and coastal ecosystems. The following could be considered:

    - Developing recommendations to developing country Parties on considerations for high-quality coastal and marine nature-based solution proposals to the GCF, and engagement in the public consultation process for the GCF sectoral guidelines on ecosystems and ecosystem services;

    - Promoting the role of non-State actors (civil society) in climate action and the development of mechanisms in the GCF and the AF, for example, to support these actions.

9. Design a code of conduct for blue and green finance which will describe in detail the basic principles of conduct standards related to the green banking sector in a way that contributes to green growth. The following could be considered:

    - Producing messaging of enhanced support which incorporates finance, technology and capacity-building, widens the scope of the support and also has positive appeal for the UNFCCC process;

    - Facilitating access to finance by local stakeholders.

10. Enhance and cultivate relationships between natural and social scientists:

    - Collecting examples from social science and health spheres that can help in the development of participatory processes.

11. Convene a dialogue between communities of practice at sessions of the Subsidiary Body for Scientific and Technological Advice or the Conference of the Parties. The following could be considered:

    - Reducing the number of side events and improving the structure of the events to ensure that they address their target audience. This would require a change being made under the Convention;

    - Using the NWP to help convene different knowledge holders to support developing countries in formulating and implementing national adaptation plans;

    - Building on the SBSTA Ocean and Climate Change Dialogue, which also provides an opportunity to consider the ocean/climate change nexus under the Convention.

CHAPTER 4

COLLABORATIVE ACTIONS AND NEXT STEPS

In partnership with the expert group on oceans, the UNFCCC secretariat has been co-designing and implementing actions, particularly in support of the LDCs and SIDS, while also collaborating with the constituted bodies under the UNFCCC process.

How has the collaboration with the NWP expert group on oceans strengthened understanding, synergies and actions under the UNFCCC? The UNFCCC secretariat has worked with the NWP expert group on oceans for more than a year to find synergies to strengthen adaptation knowledge networks and address some of the challenges.

More recent highlights include:

- The NWP Policy Brief on Oceans, highlighting key knowledge gaps and collaborative actions to build resilience of oceans, coastal areas and ecosystems;
- Participation of the expert group in the Ocean and Climate Change Dialogue to consider how to strengthen adaptation and mitigation action that took place during United Nations Climate

Dialogues. This was the first time that the expert group played an official role at the UNFCCC-mandated event. The dialogue provided an opportunity to share progress on collaborative actions and consider how the expert group can play a prominent role in strengthening action on ocean and climate change under the UNFCCC process.

- Development of a supplement to the NAP technical guidelines on developing high-quality proposals for nature-based solutions to coastal adaptation relevant to the formulation and implementation of NAPs. The supplement, which includes insights from the Green Climate Fund Secretariat and the Least Developed Countries Expert Group, is developed by the expert group on oceans and clarifies the entry points and financial instruments in order to enhance access to funding for coastal and marine nature-based solutions under the Green Climate Fund.

Collaborative actions that are currently under way include:

- Co-organization of events on innovative approaches to strengthening coastal and ocean adaptation in collaboration with the Technology Executive Committee Technology (TEC) and IUCN (FEBA). This will be part of the TEC Technology Day series of events.

- A Policy Brief on integrating data and information into relevant adaptation policies and plans;

- A Snapshot Guide on instruments and mechanisms for financing nature-based solutions for adaptation in coastal and marine ecosystems.

Next steps:

Parties will have an opportunity to consider the work undertaken by the NWP at SBSTA 52-54. Parties will be invited to determine additional collaborative actions that will help to keep the work of the expert group relevant in addressing key ocean–climate gaps and collaborate and align with the work of the UNFCCC constituted bodies.

ANNEX 1: Nairobi work programme expert group on oceans

Name of Expert	Affiliation
Florence Poulain	Food and Agriculture Organization (FAO)
Denis Chang Seng	Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO/IOC)
Khalissa Ikhlef	UNESCO
Ali Raza Rizvi	International Union for Conservation of Nature (IUCN)
Dorothée Herr	IUCN
Valentina Germani	UN Division for Ocean Affairs and Law of the Sea, Office of Legal Affairs of the United Nations
Vositha Wijenayake	SLYCAN Trust
Johanna Nalau	Griffith University
Loreley Picourt	Ocean and Climate Platform
Nicole Leotaud	Caribbean Natural Resources Institute
Michael Weisberg	University of Pennsylvania
Espen Ronneberg	The Secretariat of the Pacific Regional Environment Programme (SPREP)
Andrew Hudson	UNDP
Charlotte De Fontaubert	World Bank
Patrycja Enet	The European MSP Platform
Kristian Teleki	World Resources Institute
Lisa Schindler Murray	Rare
Gabriel Grimsditch	UN Environment Programme
Mark P. Nevitt	Syracuse University College of Law
Emily Landis	The Nature Conservancy
Hans-O. Poertner	IPCC
Elvira Poloczanska	IPCC
Ibukun Jacob Adewumi	World Ocean Council; Africa Marine Environment Sustainability Initiative (AFMENI)
Isabel Torres de Noronha	Future Ocean Alliance

ANNEX 2: Sharing knowledge and co-designing collaborative action through the 13th focal point forum of the Nairobi work programme

The 13th Nairobi work programme Focal Point Forum consisted of a high-level segment to provide space for communicating information and a technical segment for knowledge-sharing and discussions in breakout groups. [30]

At the high-level opening segment, Paul Watkinson, the Chair of the SBSTA, and Andrés Couve, from the COP 25 Presidency, provided information on political context in their opening remarks. Keynote speaker Hans-Otto Pörtner, Co-Chair of Working Group II of the Intergovernmental Panel on Climate Change, presented the findings from the Special Report on the Ocean and Cryosphere in a Changing Climate, which was an important input into the technical segment.

The technical segment, facilitated by Musonda Mumba from the United Nations Environment Programme provided an opportunity for participants to share knowledge and lessons learned and to co-design collaborative action for addressing knowledge gaps under four thematic clusters as listed below:

- Governance and participation:

  Moderator: Lisa Schindler Murray (The Nature Conservancy)

  Rapporteur: Valentina Germani (Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs of the United Nations).

- Data and methods:

  Moderator: Denis Chang Seng (Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization)

  Rapporteur: Patrycja Enet (expert consultant for the United Nations Framework Convention on Climate Change).

- Restoration and protection:

  Moderator: Dorothée Herr (International Union for Conservation of Nature)

  Rapporteur: Vositha Wijenayake (SLYCAN Trust)

- Support including capacity-building and education:

  Moderator: Michael Weisberg (University of Pennsylvania)

  Rapporteur: Johanna Nalau (Griffith University)

In the closing plenary session, the rapporteurs from each focus group reported on the key outcomes of the group discussions, which included opportunities to address knowledge gaps and enhance actions, including relevant specific actions which will be undertaken by organizations and governments and specific collaborative actions with experts and partners that can be undertaken in the context of the Nairobi work programme.

Further details on the Forum are available at https://unfccc.int/event/13th-focal-point-forum-of-the- nairobi-work-programme-on-the-ocean

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