Assessing Progress on Ocean and Climate Action: 2022-2023

Prepared for UNFCCC COP28, Dubai, UAE
30 November – 12 December 2023

2022-2023 Progress Report Collaborating Organizations

Global Ocean Forum
Acadia University
AWI
Calouste Gulbenkian Foundation
Convention on Biological Diversity
Stanford Center for Ocean Solutions
The Climate Champions Team
Race to Resilience
Race to Zero
cnrs la fondation
C
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Instituto de Ecología, Pesquerías y Oceanografía del Golfo de México
Universidad Autónoma de Campeche
European Commission
Food and Agriculture Organization of the United Nations
Global Fund for Coral Reefs
Global Ocean Trust
IMO
OA Alliance
International Alliance to Combat Ocean Acidification
IOI International Ocean Institute
IOM UN Migration
unesco Intergovernmental Oceanographic Commission
IPCC Intergovernmental Panel on climate change
IUCN
Nausicaá Boulogne-sur-Mer
NOAA
Ocean & Climate Platform
Ocean Conservancy
Ocean Voices
Oceano Azul foundation
Office of the President Republic of Palau
One Ocean Hub
PEMSEA
PML Plymouth Marine Laboratory
Prince Albert II of Monaco Foundation
RAMBOLL
RIFS Potsdam Research Institute for Sustainability Helmholtz Centre Potsdam
SAMS Scottish Association for Marine Science
UC San Diego Scripps Institution of Oceanography
The Varda Group
National Oceanography Centre
UN Office of Legal Affairs Division for Ocean Affairs and the Law of the Sea
UN environment United Nations Environment Programme
United Nations Framework Convention on Climate Change
University of Delaware
WMU World Maritime University
world ocean network
YEE Youth and Environment Europe
youth4ocean

Recommended citation:

Global Ocean Forum. 2023. Report on Assessing Progress on Ocean and Climate Action: 2022-2023. Global Ocean Forum, ROCA Report, 97p.

Copies of this report may be obtained online at:

https://roca-initiative.com/

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November 2023

DEDICATION

Dr. Patricio Bernal (1945-2022)
Executive Secretary, IOC-UNESCO (1998-2009)
Co-Founder, Global Ocean Forum

The Global Ocean Forum (GOF), formerly called the Global Forum on Oceans, Coasts, and Islands, was formed for the main purpose of convening the broad international ocean community to work for a sustainable future for oceans, coasts, and islands. Co-founded by Dr. Biliana Cicin-Sain (GOF Co-Chair and President, 2001-2020), Dr. Veerle Vandeweerd (GOF Co-Chair, 2001-2009) and Dr. Patricio Bernal (GOF Co-Chair, 2001-2009), the GOF was initiated at a special Oceans, Coasts, and Islands Conference in 2001 at the Intergovernmental Oceanographic Commission of UNESCO in Paris.

The Conference brought together experts, civil society, and governmental representatives who devised a series of concrete proposals and targets on oceans in a report which became an official Information Document to the World Summit on Sustainable Development in 2002. Most of those proposals made it into the Johannesburg Plan of Implementation, constituting a strong Oceans, Coasts, and Islands agenda that remains relevant to the global ocean community to this day. At Johannesburg, the GOF co-founders coordinated action amongst a group of 42 organizations - resulting in a unanimous call from the participants to continue with the coordination of efforts during WSSD implementation. Thus, the GOF was born.

Having played an integral leadership role in the creation of the GOF, Dr. Bernal (then Executive Secretary of IOC-UNESCO), strongly supported subsequent GOF initiatives including the organization and conduct of global ocean conferences. Most of these conferences were hosted by IOC-UNESCO, which aimed at mobilizing the global ocean community for the implementation of the commitments made at the 2002 WSSD on oceans, coasts, and islands, as well as tracking progress in meeting these commitments. The GOF owes Dr. Bernal for its birth and development into an informal alliance of ocean stakeholders which continues to be responsive to the need for fostering cross-sectoral dialogue on ocean issues among governments, nongovernmental organizations (NGOs), international organizations (IGO), the private sector and scientific sectors, and academia. This 2022-2023 Report on Assessing Ocean and Climate Action is a testament to the continuing GOF cross-sectoral initiatives and is thus warmly dedicated to Dr. Bernal with gratitude and recognition of his important role and contributions to the GOF.

"I first met Dr. Patricio Bernal when, as a newly arrived Programme Officer at the CBD Secretariat, I was sent to attend a meeting of UN-Oceans in Paris. The meeting was intimidatingly full of ocean leaders from various UN organizations, all of them much more senior than I was. Patricio, who was at the time the Executive Secretary of IOC UNESCO, was instantly warm and welcoming and quick to offer to collaborate on projects. Over the years, I met him many times at meetings around the world and was always impressed by his kindness, humanity, and willingness to provide good conversation over glasses of wine. He was an exceptional scientist, but what I remember best are his smile and his patient and gentle mentoring on how to best develop a career in the world of international ocean policy. I will always be grateful to him for the warm welcome he offered me at UN-Oceans, and his wise, friendly, and encouraging guidance over the years."

- Marjo Vierros, Head of Science Policy Research, Ocean Voices, and Senior Associate, Global Ocean Forum

"Patricio was a great promoter of public education and outreach in support of sustainable development of the ocean. He believed that since citizens live on land, not in the sea, citizens of the land should become citizens of the ocean, so that they can talk and act as ambassadors of the ocean on our blue planet. That's the reason he asked me to create, with other partners, the World Ocean Network. Thereafter, we worked towards the United Nations designation of the June 8 World Oceans Day, and the creation of the Passport of Citizen of the Ocean."

- Philippe Vallette, former Director General, Nausicaá, Centre National de la Mer, France, Chairman of the International Aquarium Network Steering Committee, and Board Director, Global Ocean Forum

"Having been a former Under-Secretary of State for Fisheries in Chile and leading biological oceanographer, Patricio had a deep understanding of the importance of underpinning ocean policy processes with robust scientific information. During his 10 years tenure as IOC Executive Secretary, I had the chance to work closely with him and learn, including through the several Global Forum conferences that we organized together. Some of his achievements on international ocean development included the development of a Global Tsunami warning system, the development of a global framework for assessing the state of the marine environment (now known as the World Ocean Assessment), and the consolidation of a global architecture to observe the ocean (the Global Ocean Observing System). But as always, what matters most is the fact that Patricio was a warm person, passionate about science and the ocean, inspirational and dedicated to growing younger talents."

- Julian Barbière, Head, Marine Policy Section, UN Ocean Decade Coordinator, IOC/UNESCO

Foreword

This 2022-2023 edition of the *Assessing Progress on Ocean and Climate Action r*eport, like the earlier issues, is a multi-organizational effort involving old and new partners. Sixty-seven (67) co-authors from 46 organizations have collaborated to produce this report, which aims to provide multidisciplinary updates on various sectoral and stakeholder initiatives in science, policy development, financing and other cross-cutting efforts on ocean and climate action. A must-read for Party negotiators and non-Party stakeholder representatives at the 28th Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), this report provides information on positive forward movement and success stories - as well as identified needs and gaps – in ocean affairs. This analysis is helpful in advancing more robust efforts toward the integration of ocean affairs in various program streams of the UNFCCC, including through the nationally determined contributions (NDCs), National Adaptation Plans (NAPs) and the Global Stocktake (GST). In addition, it points to opportunities for integrating efforts across sectors and environments. As Dr. Hans-Otto Pörtner (IPCC and AWI) indicated in the report, it is important to highlight the integrated roles of atmosphere, land, coast and ocean and the commonalities and specifics of how to leverage them towards accelerating collective progress in achieving the Paris Agreement targets, as well as the more general global sustainability agenda.

In addition to promoting awareness of the pivotal role of oceans in climate change, this volume reports on the use of ocean-based mitigation approaches (such as Blue Carbon, reducing air emissions from ships, renewable energy, carbon capture and storage); deployment of a wide variety of adaptation measures, especially based on ecosystem approaches; fostering the low carbon Blue Economy; addressing the issues of human displacement; and providing adequate provision of financial flows and of capacity development. Important new additions to this volume are reports on the Ocean and Climate Change Dialogue 2023 and the GST, public engagement and outreach, mainstreaming gender into ocean and climate action and climate change, and new developments in ABNJ including the new BBNJ agreement.

This report, dedicated to the memory of Dr. Patricio Bernal, co-founder of the Global Ocean Forum (GOF), is a testament to the continuing cross-sectoral initiatives that the founding partners envisioned for the Global Ocean Forum roadmap to promote good governance of the ocean, healthy marine ecosystems, and sustainable development. A key strategy is maintaining its global network of partners which includes the cadre of professionals that benefited from the legacy and mentorship of Dr. Biliana Cicin-Sain, past GOF President and co-founder. These include co-authors Joseph Appiott, Nigel Bradly, Indumathie Hewawasam, Evelia Rivera Arriaga, Miriam Balgos and volume editor Kevin Goldstein, as well as the inaugural Dr. Biliana Cicin-Sain Fellow, co-author Sarah Davidson. This report will be issued by the GOF biennially, together with its collaborating partners, to continue the legacy of the Roadmap to Oceans and Climate Action (ROCA) initiative.

This report was organized by Sarah Davidson, Miriam Balgos, and Larry Hildebrand, and in addition to the co-authors, benefited from the assistance and contributions of the following collaborators: Travis Aten of Communications Inc; Alison Clausen of IOC-UNESCO; Anete Berzina-Rodrigo and Minna Epps of IUCN; Gonzalo Cid of NOAA; and Edward Allison of WorldFish Center.

Richard Delaney, President, Global Ocean Forum Board of Directors;
Executive Director, Center for Coastal Studies, Provincetown, Massachusetts

Executive Summary

Globally, the world was rocked by major disasters in 2022, including 14 severe weather events, six floods, five droughts, three tropical cyclones, and one windstorm. Human-caused climate change will only intensify these events, and vulnerable populations globally will face more severe, extreme displacement in the future. As the planet's greatest carbon sink, the ocean acts as a buffer that protects our atmosphere from seeing the full effects of climate change. This causes extreme stress to marine systems, and the full impacts of that stress are largely unknown. Bold and innovative actions are needed to protect ocean health, build more sustainable and resilient economies, reduce poverty, and help the most vulnerable.

The Impacts of Climate Change on the Ocean Today

- The most recent United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) AR6 Report shows that ocean warming, ocean acidification and deoxygenation will continue to increase in the 21st century at rates dependent on future emissions of carbon dioxide (CO_2) and other greenhouse gases.
- The extent and magnitude of climate change impacts are larger than estimated in previous assessments.
- The ocean is under stress from climate change, pollution, habitat and biodiversity loss, overfishing and destructive fishing, and other unsustainable human activities. Impacts include species loss driven by increases in extreme heat events, loss and degradation of coral reefs, low-lying coastal wetlands and kelp-forests.
- In its most recent resolution on oceans and the Law of the Sea (A/RES/77/248), the General Assembly of the UN (UNGA) specified that the current and projected adverse effects of climate change on the marine environment and marine biodiversity include rising seawater temperature, ocean deoxygenation, sea-level rise, and ocean acidification.

Meeting the long-term goals of the Paris Agreement

- The scientific evidence is clear: as a major climate regulator and the largest living space on Earth, the ocean is instrumental to deliver on the goals of the Paris Agreement and the Global Biodiversity Framework (GBF).
- Global emissions are not in line with modelled global mitigation pathways consistent with the temperature goal of the Paris Agreement, and there is a rapidly narrowing time window to raise ambition and implement existing commitments to limit warming to 1.5°C above pre-industrial levels.
- The ocean should be a key element of the climate change response toolkit if we are to keep the 1.5°C goal alive and avoid the worst consequences of climate change.

The Ocean in the UNFCCC Processes

- The UN Framework Convention on Climate Change (UNFCCC) COP26 outcome document the Glasgow Climate Pact included the following decisions:
  - *Invites the relevant work programmes and constituted bodies under the UNFCCC to consider how to integrate and strengthen ocean-based action in their existing mandates and work plans and to report on these activities within their existing reporting processes, as appropriate* (Paragraph 60 of the Glasgow Climate Pact);
  - *Also invites the Chair of the Subsidiary Body for Scientific and Technological Advice (SBSTA) to hold an annual dialogue, starting at the fifty-sixth session of the Subsidiary Body for Scientific and Technological Advice (June 2022), to strengthen ocean-based action and to prepare an informal summary report thereon and make it available to the Conference of the Parties at its subsequent session* (Paragraph 61 of the Glasgow Climate Pact).
- The UNFCCC COP27 outcome document the Sharm el-Sheikh Implementation Plan included the following decisions:
  - *Welcomes the outcomes of and key messages from the ocean and climate change dialogue in 2022 and decides that future dialogues will, from 2023, be facilitated by two co-facilitators, selected by Parties biennially, who will be responsible for deciding the topics for and conducting the dialogue, in consultation with Parties and observers, and preparing an informal summary report to be presented in conjunction with the subsequent session of the Conference of the Parties* (Paragraph 45 of the Sharm el-Sheikh Implementation Plan);
  - *Encourages Parties to consider, as appropriate, ocean-based action in their national climate goals and in the implementation of these goals, including but not limited to nationally determined contributions, long-term strategies and adaptation communications* (Paragraph 46 of the Sharm el-Sheikh Implementation Plan).
- The Ocean and Climate Change Dialogue 2022 highlighted the vital importance of our oceans to

livelihoods and biodiversity, as well as a fundamental component of the climate system. In key messages for COP28, the Ocean and Climate Change Dialogue 2023 urged Parties to mainstream ocean-related mandates from COP26 and COP27/CMA4 into their national climate goals and in the implementation of these goals (including within UNFCCC processes such as the Global Stocktake [GST] political outcomes, Global Goal on Adaptation [GGA], and the financial mechanism).

- Progress on implementing COP26 and COP27 mandates on the ocean includes:
  - An increasing number of Parties are targeting ocean-based climate action, and several Parties include an ocean-based climate target, policy or measure. Current progress in integrating the ocean into national policies and strategies falls short of fulfilling the Conference of the Parties (COP) mandates to 'blue' the Paris Agreement.
  - Integrating the ocean into various UNFCCC constituted bodies and work programme was also advanced through the Technology Executive Committee, in the Joint Work Programme of the UNFCCC Technology Mechanism for 2023–2027, the Nairobi Work Programme and the Glasgow–Sharm el-Sheikh Work Programme.
  - The Ocean and Climate Change Dialogue 2023 identified the Global Stocktake process as a unique opportunity to highlight the importance of the ocean in the global response to climate change and to promote the establishment of guidelines for Parties to be able to include and strengthen ocean-based measures in their updated nationally determined contributions (NDCs), National Adaptation Plans (NAPs), and other national strategies.
  - With the support of the UN High-Level Climate Champions, the Ocean & Coastal Zones community under the Marrakech Partnership for Global Climate Action launched the Ocean Breakthroughs which identify turning points to reach by 2030 to achieve a healthy and productive ocean in 2050.

The Interconnectivity of Climate and Biodiversity

- Climate change and biodiversity loss are typically addressed separately despite being inextricably intertwined, particularly in the ocean. There is growing recognition of the imperative to strengthen synergies between climate and biodiversity.
- In the context of the ocean, higher temperatures increase the risk of irreversible loss of marine and coastal ecosystems. Widespread changes have been observed, including damage to coral reefs and mangroves that support ocean life and migration of species to higher latitudes and altitudes with cooler waters.
- Encouragingly, the new Biodiversity Beyond National Jurisdiction (BBNJ) Agreement is focused on biodiversity conservation and sustainable use in the high seas, including increasing climate resilience. The Agreement opened for signatures in September 2023 and has 83 signatories at the time of publication.

National Adaptation Plans and the Ocean

- Over 70% of new or revised NAPs place the ocean and coastal zones as central to their climate resilience strategies.
- The 2022 UNEP Adaptation Gap Report notes that current adaptation practice still falls woefully short of what is required, in both nature and extent.
- Incremental actions, which aim to build on and improve the efficiency of conventional adaptation methods for climate risk reduction and management but fail to address future risks from climate change become obstacles to adaptation and may reinforce existing vulnerabilities or introduce new risks.
- Effective engagement is key, yet many programs do not adequately involve stakeholders and overlook local contexts and power dynamics.

Nature-based Solutions

- Nature-based Solutions for addressing climate mitigation and adaptation have become increasingly prominent strategies for climate mitigation, and conservation and restoration of coastal and marine ecosystems need to be part of these solutions.
- "Blue carbon" ecosystems such as mangroves, seagrasses, and salt marshes capture and store significant amounts of carbon. Protecting and restoring these ecosystems contributes to climate change mitigation and adaptation while achieving several national targets in relation to the Sustainable Development Goals (SDGs).
- Many countries and organizations have accelerated efforts to reduce carbon emissions and promote sustainability in marine and coastal areas. These achievements include increased investments in


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offshore wind energy projects, the expansion of sustainable aquaculture practices, and the establishment of new marine protected areas.

Other Advances in Ocean Mitigation

- The International Maritime Organization (IMO) continues its efforts to phase out GHG emissions from international shipping as soon as possible while promoting a just and equitable transition through its 2023 IMO Strategy.
- Among marine renewable energy resources, offshore wind, which is currently the most mature and widely deployed technology, is a significant renewable energy resource that can meet renewable energy demand for many coastal nations. According to the 2023 Global Offshore Wind Report, a total of 64.3 G W of offshore wind capacity across nineteen countries was in operation by the end of 2022, accounting for 7.1% of global wind power installation.

Understanding the Ocean and Climate Change Impacts

- The UN Decade of Ocean Science for Sustainable Development (the "Ocean Decade") is a once in a lifetime opportunity to deliver a step-change in the generation and use of ocean science.
- The impacts of climate change are not acting in isolation, and understanding cumulative stress from the impact of multiple ocean stressors is still a major knowledge gap.
- The rapid but uncoordinated growth in the number and diversity of ocean data sources unintentionally hinders the effective discovery of, and access to, information needed to address the Ocean Decade Challenges
- The process for enhancing collaboration and understanding and building ocean-based climate action is supported through increasingly frequent and impactful high-level dialogues, collaborations and outputs at the global, regional and national levels. These bodies and initiatives are serving to advance synergies in the integrated ocean-climate agenda.
- National Ocean Acidification Action Plans help governments actively address localized manifestations of ocean acidification (OA) by increasing understanding of the impacts of OA to their region and prioritizing mitigation, adaptation, and resilience activities nearshore.
- Analysis of mainstream media indicated a gap in communication at the intersection of ocean and climate. Aligned messaging through the efforts of the OneOcean Flotilla resulted in shared messaging and communications resources around key events, including COP27 and other major ocean related fora.

Food Security

- The IPCC AR6 states with high confidence that ocean warming and ocean acidification have already affected food production and security, including shellfish aquaculture and fisheries in some regions.
- Climate change has affected the biogeographical distribution of fish species towards the high latitudes, jeopardizing food security and livelihoods in the tropics and causing forced migration among coastal communities that rely on fisheries resources.

Impacts on the Vulnerable

- The devastating impacts of climate change on Indigenous Peoples, small-scale fishers, women, and children is increasingly evident. Indigenous and traditional knowledge and their knowledge holders are often marginalised from international and national dialogues shaping the future of our ocean and climate.

Finance

- Finance is a key component in the development of a sustainable and regenerative blue economy that supports healthy ocean and climate systems.
- There has been a marked increase in public and private finance to deliver ocean-climate mitigation solutions. The 2023 BlueInvest Report from the European Commission found that 87% of investors surveyed plan to invest in the blue economy.
- At least US$1 trillion of additional finance is needed between now and 2030 to facilitate a rapid transition to achieve ocean-climate solutions.

Recommendations

Integrating the Ocean in the UNFCCC Processes

- The Ocean and Climate Change Dialogue 2023 called on Parties to commit to mainstreaming ocean-based actions into national commitments. Key recommendations include, among others:
    - Integrating mitigation and adaptation action for coastal ecosystems into national and regional policies, including NDCs and NAPs.
    - Integrating aquatic food climate solutions within national processes, as well as at the multilateral level - including within the UNFCCC process.
    - Fostering partnerships, strengthening regulatory frameworks, and adopting a whole of society approach with Indigenous Peoples, local communities, vulnerable groups including youth and women and the private sector is essential to give climate policies social buy-in and stability in their implementation.
    - Strengthening ocean-based systematic observation, research and data management must improve the understanding of carbon cycling and support science-based decision making, with a focus on first filling knowledge gaps that are preventing the ocean from being more widely and effectively included in the NDCs. Standardized data and knowledge systems are essential to achieve this and must be communicated, coordinated, and openly shared among national and international agencies.

- Providing access to stable and accessible finance flows and capacity building.
- For Parties to mainstream ocean-related mandates from COP26 and COP27/CMA4 into their national climate goals and in the implementation of these goals.
- Strengthening institutional linkages between partners at national and international levels and across UN mandates and processes such as the Global Biodiversity Framework and the BBNJ Agreement to enhance global ambition and action for a climate resilient ocean.
- The GST is a unique opportunity to highlight the importance of the ocean in the global response to climate change and for GST political outcomes to promote the establishment of guidelines for Parties to be able to include and strengthen ocean-based measures in their updated NDCs, NAPs, and other national strategies throughout future implementation of the Paris Agreement.

Coordination and collaboration

- There is an urgent need to develop a multi-actor coalition across different international treaties and UN bodies to protect and restore the ocean's contributions to climate regulation, human well-being and planetary health.
- High-level dialogues, collaborations and outputs at the global, regional and national levels should be supported and linked as they continue to advance the synergies in the integrated ocean-climate agenda.

Mitigation and adaptation

- Parties should mainstream mitigation and adaptation action for coastal ecosystems into national and regional policies, including NDCs and NAPs.
- More needs to be done to understand the vulnerability and contribution of deep-sea ecosystems to climate change mitigation, particularly considering the potential adverse impacts of deep-sea mining.
- A strategic process for prioritizing and closing knowledge gaps needs to occur alongside guidance on enabling conditions for ocean and coastal adaptation measures.
- Adaptation measures should prioritize equity, justice, cooperation, and inclusive decision making with local communities and Indigenous Peoples.


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Stakeholder engagement, capacity building, and finance

- Stakeholder engagement, particularly with vulnerable populations, must be central to the development of NDCs and NAPs.
- Mainstreaming gender in the integrated management of marine and coastal ecosystems must be prioritized for ocean-climate initiatives.
- Further efforts are needed to better integrate human mobility into relevant multilateral processes and translate global policy principles and commitments into tangible on-ground actions.
- Young people, who are the future leaders of global climate and ocean advocacy efforts, must be prepared and empowered with hard and soft skills that they will need to cope with the impacts of climate, biodiversity and ocean change.
- Multilateral Development Banks (MDBs), development finance institutions (DFIs) and private financial institutions will need to better integrate adaptation and resilience impacts into their investment portfolios and scale up ambition for future investment.

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1. INTRODUCTION

1.1 Purpose of the progress report

Following the four previous Roadmap to Oceans and Climate Action (ROCA) reports, this 2022-2023 report provides an update on recent initiatives while taking stock of the progress in implementing the ocean and climate agenda at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP), in other global policy processes, as well as regionally and nationally. The report also provides recommendations for future action where possible.

The ROCA initiative was first adopted in 2016, and since then there has been a growing international recognition of the ocean as a fundamental component of our climate system. This has been demonstrated by an increasing focus on ocean issues at the UNFCCC. Recently, the ocean-climate community welcomed the incorporation of the ocean into the text of the COP26 outcome document Glasgow Climate Pact,[1] which, among others; 1) invited the relevant work programmes and constituted bodies under the UNFCCC to consider how to integrate and strengthen ocean-based action in their existing mandates and workplans and to report on these activities within the existing reporting processes, as appropriate; and 2) mandated an annual ocean and climate change dialogue starting at the fifty-sixth session (June 2022) of the Subsidiary Body for Scientific and Technological Advice (SBSTA). The Sharm el-Sheikh Implementation Plan,[2] adopted at COP27, called for the inclusion of technical capacity building and financing. The main goal of the plan focused on understanding the needs of the Parties when it comes to assessing risk and responding to changing ocean and coastal conditions in the face of ongoing climate change in the dialogue themes. It also emphasized the need to address gaps in the global climate observing system, particularly in developing countries, and to enhance coordination of systematic observation activities.

There is growing evidence that the restoration and protection of ocean health is evolving into a significant component of both national and global strategies to respond to the impacts of climate change. The Sharm el-Sheikh Implementation Plan encouraged Parties to include ocean-based action in the development and implementation of national climate goals, including their nationally determined contributions (NDCs), long-term strategies and adaptation plans. This has become a primary focus of a significantly increasing number of events organized around the ocean-climate nexus at UNFCCC Conference of the Parties (COPs) and other international fora.

In 2023, we find ourselves in a place where we can celebrate real progress that has been made during prior years. Nature-based solutions (NbS) to climate change are becoming more prominent, as is the growing renewable energy sector. Sustainable fishing practices are widespread and proving impactful, while new scientific findings and technological innovations are outpacing past progress at an impressive rate. However, we still have a long way to go before the ocean and climate are truly integrated in adaptation and mitigation response measures, as well as national and global policies. In particular, the results of the first ever Global Stocktake (GST) distinctly emphasize the impacts of these gaps on achieving the goals of the Paris Agreement. There is still much work to be done to raise public awareness about the importance of the ocean for climate, for biodiversity, and as a life support system for our planet. Ambition on ocean-climate action needs to be raised, with sufficient and predictable financing made available. Thus, in addition to reporting on progress made, this document also addresses future ocean-climate actions that should be considered as priorities for the coming years.

The information on progress achieved by ocean and climate initiatives provided in this report is by no means complete, but it represents a fair amount of information illustrative of the gains so far achieved in integrating the ocean in the UNFCCC processes and advancing ocean and climate action elsewhere.

1.2 Progress on the ocean and climate nexus within UNFCCC

Relevance of the ocean under the Convention and the Paris Agreement

The ocean holds the key to an equitable and sustainable planet. The Intergovernmental Panel on Climate Change (IPCC) Climate Change 2023 Synthesis report identifies that climate change has already caused widespread impacts and related losses and damages on human systems, as well as altered ocean ecosystems worldwide.[3] However, there is an increasing recognition not just of the impact of climate change on the ocean, but also that the ocean is a place where urgent climate action is needed and can provide significant positive potential.

1 Lennan, M., & Morgera, E. 2022. The Glasgow Climate Conference (COP26). The International Journal of Marine and Coastal Law, 37(1), 137-151. https://doi.org/10.1163/15718085-bja10083

2 See https://unfccc.int/documents/624444 for more information on the Sharm el-Sheikh Implementation Plan

3 Lee, H., Calvin, K., Dasgupta, D., Krinner, G., Mukherji, A., Thorne, P., ... & Zommers, Z. 2023. Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available at https://www.ipcc.ch/report/ar6/sy

Parties to the UNFCCC have recognized the importance of protecting the ocean and its ecosystems in the UNFCCC (hereinafter referred to as the "Convention") and the Paris Agreement, as included under the definitions in Article 1.3 of the Convention[4] and the Preamble of the Paris Agreement.[5]

These definitions further stress the interconnected nature of the Earth – as the ocean, atmosphere, land, nature, and indeed human beings all belong to the same system. Further, Article 4.1 of the Convention commits the Parties inter-alia to, "... promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate of oceans."[6]

Relevant COP outcomes on the ocean

It was not until COP25 (25th Conference of the Parties) and the Chile Madrid Time for Action 2019 that governments recognized the need to strengthen the understanding of, and action on, ocean and climate change under the UNFCCC.[7] COP25 mandated the first Ocean and Climate Change Dialogue[8] (herein referred to as the Dialogue), drawing upon the knowledge and scientific findings from the IPCC Special Report on the Ocean and Cryosphere in a changing climate.[9]

At COP26, Parties invited the relevant work programmes and constituted bodies under the UNFCCC to consider how to integrate and strengthen ocean-based action into their existing mandates and work plans and to report on these activities within their existing reporting processes. Parties also invited the SBSTA Chair to hold an annual Dialogue to strengthen ocean-based action.

The Ocean and Climate Change Dialogue 2022 highlighted the vital importance of our oceans to livelihoods and biodiversity, as well as a fundamental component of the climate system. This dialogue also emphasized the need, options and opportunities for greater ocean-related climate action.[10] Discussions centered around how to strengthen and integrate national ocean climate action under the Paris Agreement and how to enable ocean-climate solutions and support, including financial support.[11]

At COP27/CMA4 (4th Conference of the Parties serving as the meeting of the Parties to the Paris Agreement), the COP Sharm el-Sheikh Implementation Plan (Decision 1/CP.27 para. 50)[12] and CMA Sharm el-Sheikh Implementation Plan (Decision 1/CMA4 para. 79) continued to strengthen ocean-based action under the process and encouraged Parties to consider, as appropriate, ocean-based action in their national climate goals and in the implementation of these goals, including but not limited to nationally determined contributions, long-term strategies and adaptation communications.[13]

Regarding the Dialogue, COP27 welcomed the outcomes and key messages from the Ocean and Climate Change Dialogue 2022. It was decided that future Dialogues from 2023 and beyond will be facilitated by two co-facilitators, selected by Parties biennially, who will be responsible for deciding the topics for and conducting the Dialogue, in consultation with Parties and observers. These co-facilitators will also be responsible for preparing an informal summary report to be presented in conjunction with the subsequent session of the Conference of the Parties. Mr. Julio Cordano (Chile), and Mr. Niall O'Dea (Canada) are the Ocean and Climate Change Dialogue co-facilitators for the biennium 2023-24.

The Ocean and Climate Change Dialogue 2023

The Ocean and Climate Change Dialogue is now mandated as an annual dialogue under the UNFCCC.[14] The 2023 Dialogue follows on from the two previous Dialogues in 2020 and 2022, which identified that the ocean-climate nexus is a place for sustainable climate-smart ocean and coastal solutions, as well as actions based on the best available science, that can be reflected in national climate goals, policies and strategies and effect a sustainable ocean economy.

The Dialogue in 2023[15] was held on 13–14 June 2023 in conjunction with the Subsidiary Body session in Bonn, Germany.[16] The co-facilitators proposed a solution-focused discussion at the 2023 Dialogue 2023, building on

4 Article 1.3 of the Convention states, "Climate system" means the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions."

5 Paris Agreement preamble inter-alia states, "the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity…".

6 Article 4.1 on Commitments: "all Parties shall promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems."

7 UNFCCC Secretariat. 2019. Report of the Conference of the Parties on its twenty-fifth session, held in Madrid from 2 to 15 December 2019. Addendum. Part two: Action taken by the Conference of the Parties at its twenty-fifth session. Available at: https://unfccc.int/documents/210476

8 UNFCCC SBSTA. 2021. Ocean and climate change dialogue 2020. Informal summary report by the Chair of the Subsidiary Body for Scientific and Technological Advice. https://unfccc.int/sites/default/files/resource/SBSTA_Ocean_Dialogue_SummaryReport.pdf?_gl=1*1c16b70*_ga*MTAxOTM0MTg3MS4xNjkwOTkwOTk2*_ga_7ZZWT14N79*MTY5NzU3Njc3NC4yMy4xLjE2OTc1NzY4NDAuMC4wLjA.

9 IPCC. 2019. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 755 pp. https://doi.org/10.1017/9781009157964.

10 See https://unfccc.int/event/ocean-and-climate-change-dialogue-2022

11 UNFCCC SBSTA. 2022. Ocean and climate change dialogue 2022. Informal summary report by the Chair of the Subsidiary Body for Scientific and Technological Advice.

12 UNFCCC Secretariat. 2022. Report of the Conference of the Parties on its twenty-seventh session, held in Sharm el-Sheikh from 6 to 20 November 2022. Addendum. Part two: Action taken by the Conference of the Parties at its twenty-seventh session

13 UNFCCC Secretariat. 2022. Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fourth session, held in Sharm el-Sheikh from 6 to 20 November 2022. Addendum. Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its fourth session.

14 See https://unfccc.int/topics/ocean#Ocean-dialogues

15 UNFCCC Secretariat. 2023. Momentum Builds to "Blue" Climate Action at June Ocean Dialogue. https://unfccc.int/news/momentum-builds-to-blue-climate-action-at-june-ocean-dialogue

16 For day 01 of the OD2023, see here: https://unfccc.int/event/ocean-and-climate-change-dialogue-2023-day-1. For day 2 of OD2023, see here: https://unfccc.int/event/ocean-and-climate-change-dialogue-2023-mandated-event.

the outcomes of the past Dialogues.

The Dialogue focused on how to accelerate action to foster climate resiliency and to curb emissions within the ocean-climate nexus. It focused specifically on coastal ecosystem restoration, blue carbon ecosystems, and fisheries and food security. As mandated, the co-facilitators selected the topics and conducted the Dialogue in consultation with the SBSTA Chair. The co-facilitators prepared an information note in advance that provided the choice of topics, guided questions, and proposed an approach based on consultations with Parties and observers, which took place in March 2023.[17] The Dialogue offered a vital forum for a) enhancing collaboration, understanding and building ocean-based climate action; b), illustrating needs, opportunities and case studies; and c) highlighting key messages and ways forward.

The 2023 Ocean and Climate Change Dialogue Informal Summary Report highlights the need for Parties to commit to mainstreaming ocean-based actions into national commitments.[18] During the Dialogue, over 250 case studies were submitted by Parties and stakeholders that provided concrete practical solutions and recommendations to Parties for developing ocean-based climate action and goals.[19]

Several key messages also emerged during the Dialogue. On the topic of coastal ecosystem restoration and blue carbon ecosystems, participants expressed the need to integrate mitigation and adaptation action for coastal ecosystems into national and regional policies, including NDCs and national adaptation plans (NAPs). The Parties highlighted several strategies to support ocean-based climate action, including: a) strengthening of blue carbon accounting methodologies and tools; b) advancing natural national accounting, ecosystem mapping, and robust indicators; and c) promoting sustainable management of coastal ecosystems and recognition of their direct benefits beyond mitigation.

On the topic of fisheries and food security, participants urged the need to integrate aquatic food climate solutions within national processes, as well as at the multilateral level - including within the UNFCCC process. Furthermore, other strategies highlighted to support the just transition to renewable energy sources and low carbon practices included: a) the importance of an ecosystem-based approach in fisheries management; b) recognition of the role of aquatic food for food security and the carbon cycle; and c) decarbonization of the entire value chain of aquatic food production.

Cross-cutting key messages underlined the importance of fostering partnerships with local communities, Indigenous Peoples, marginalized groups and the private sector to address policy barriers, facilitate investments and promote effective conservation efforts. Stable and accessible finance flows and capacity-building were also identified as key elements to foster sustainable fishing practices and coastal ecosystem restoration and management - especially in developing countries. The importance of strengthening ocean-focused research and data management, bridging knowledge gaps and promoting standardized data sharing to effectively integrate the ocean into climate commitments, were also stressed.

In key messages for COP28, Parties were urged to mainstream ocean-related mandates from COP26 and COP27/CMA4 into their national climate goals and in the implementation of these goals (including within UNFCCC processes such as the GST political outcomes, Global Goal on Adaptation [GGA], and the financial mechanism). Strengthening of institutional linkages between partners at national and international levels and across UN mandates and processes such as the Global Biodiversity Framework (GBF) and Biodiversity Beyond National Jurisdiction (BBNJ) treaty to enhance global ambition and action for a climate resilient ocean, was further encouraged. All constituted bodies were urged to continue reporting on ocean-related activities in the context of their mandates, and at the Dialogue.

Progress on implementing COP26 and COP27 mandates on the ocean: Opportunities and challenges

The ocean offers a space for integrated solutions that can be reflected in national climate policies and strategies (e.g., NDCs, NAPs, biennial transparency reporting, Adaptation Communications, etc.). An increasing number of Parties are targeting ocean-based climate action, and several Parties include an ocean-based climate target, policy or measure. As reported in the NDCs synthesis document prepared by the UNFCCC secretariat,[20] ocean-related measures reported in the NDCs relate more often to adaptation than to mitigation, with an increase in adaptation measures identified related to fisheries and aquaculture.[21]

Encouragingly, a growing recognition of the mitigation

17 UNFCCC SBSTA. 2023. Ocean and Climate Change Dialogue 2023. Information note by the Co-Facilitators of the ocean and climate change dialogue 2023–2024. https://unfccc.int/sites/default/files/resource/Ocean_Dialogue_2023_Information_Note.pdf

18 UNFCCC Secretariat. 2023. Informal summary report of the ocean and climate change dialogue 2023. https://unfccc.int/documents/631689

19 For information on breakout group case studies at the Ocean and climate change dialogue 2023, see: https://unfccc.int/sites/default/files/resource/Breakout%20Group%20Case%20Studies%20and%20Best%20Practices%20at%20the%20Ocean%20and%20climate%20change%20dialogue%202023.pdf

20 UNFCCC Secretariat. 2022. Nationally determined contributions under the Paris Agreement. Synthesis report by the secretariat.
Available at: https://unfccc.int/documents/619180

21 UNFCCC SBSTA. 2023. Ocean and Climate Change Dialogue 2023 Information note by the Co-Facilitators of the ocean and climate change dialogue 2023–2024. Available at: https://unfccc.int/sites/default/files/resource/Ocean_Dialogue_2023_Information_Note.pdf

co-benefits stemming from ocean-based adaptation actions is emerging, especially in coastal ecosystem protection and restoration. This recognition is further mirrored in over 70% of new or revised NAPS, where the ocean and coastal zones are central to climate resilience strategies.[22] However, current progress in integrating the ocean into national policies and strategies falls short of fulfilling the COP mandates to 'blue' the Paris Agreement.

Additionally, the UNFCCC Constituted Body, the Technology Executive Committee (TEC), has been involved over the last few years in policy discussions around innovation and technologies for strengthening climate ambition and action in coastal zones and oceans. Further, Activity C.4.1 of the Joint Work Programme of the UNFCCC Technology Mechanism for 2023–2027 pertains to innovative ocean climate solutions and technological innovations for ocean-based actions, including how technology can help address issues related to marine protected areas and achieve the SDG 14.[23] This includes participation in the UNFCCC Ocean and Climate Change Dialogue.[24]

The SBSTA process includes consideration of emerging science and research under the Research and Systematic Observation agenda item, including emerging maritime technologies that have the potential to contribute to achieving the long-term temperature goal of the Paris Agreement and the goals of the UNFCCC.[25] The SBSTA research and systematic observation agenda continues to consider gaps and needs in relation to ocean science.[26]

The Nairobi work programme (NWP) serves as the UNFCCC knowledge-to-action hub on adaptation and resilience.[27] The NWP expert group on oceans[28] has been working since 2019 to address the specific knowledge needs of countries in oceans, coastal areas and ecosystems and provide policy-relevant advice.[29]

Discussions at the Glasgow–Sharm el-Sheikh Work Programme on the Global Goal on Adaptation, the fourth workshop focused on communicating and reporting on adaptation priorities, emphasised the importance of incorporating ocean and coastal-based adaptation priorities and actions in communicating and reporting on adaptation under the UNFCCC. Linking to key messages from the 2022 Ocean and Climate Change Dialogue, the workshop reported on how integrated ocean-based solutions can be reflected in national climate policies and strategies.[30]

The GST process is part of how the Paris Agreement evaluates progress and encourages collaboration among Parties in addressing climate change. Article 14.3 of the Paris Agreement emphasizes that the GST should inform Parties in enhancing their climate actions and bolstering international cooperation.[31]

The significance of the ocean in tackling climate change has already been highlighted in the three GST Technical Dialogues. The first Technical Dialogue summary report primarily referenced climate impacts to the ocean and ocean-based climate solutions in the discussions of climate adaptation.[32] The relevance of the ocean to climate change mitigation was noted during the second Technical Dialogue[33] mainly in relation to ecosystems and ocean-climate actions. During the third Technical Dialogue meeting held in June 2023, many participants placed significant importance on including ocean, coastal and marine systems and biodiversity within climate action strategies. Additionally, several participants emphasised that the ocean be reflected in the outcomes of the GST.[34]

The technical dialogues, and now the GST synthesis report, have laid the groundwork for elevating the prominence of the ocean in climate endeavors; however, there remains an urgent need for deeper integration in the GST process.

During the 2023 Ocean and Climate Change dialogue (which resulted in several key messages for COP28), the GST was identified as a unique opportunity to highlight the importance of the ocean in the global response to climate change and to promote the establishment of guidelines for Parties to be able to include and strengthen ocean-based measures in their updated NDCs, NAPs, and other national strategies.

In their submission on the elements for the consideration of the GST outputs component towards GST1

22 UNFCCC Secretariat. 2022. Progress in the process to formulate and implement national adaptation plans. Note by the secretariat. See https://unfccc.int/documents/621664.

23 UNFCCC. 2022. Joint Work Programme of the UNFCCC Technology Mechanism for 2023–2027. Available at: https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEC_key_doc/7d75f184dddb411a8efe3701ebf3969a/3009eb49531f4e058ca9052eb73999bf.pdf

24 For further information, refer to Para 79 of the OD 2023 Information Note

25 UNFCCC. Research and Systematic Observation. https://unfccc.int/topics/science/workstreams/RSO

26 For further information, refer to Para 36 of the OD 2023 Information Note

27 UNFCCC. The Nairobi Work Programme: UNFCCC knowledge-to-action hub on adaptation and resilience. https://unfccc.int/topics/adaptation-and-resilience/workstreams/the-nairobi-work-programme-unfccc-knowledge-to-action-hub-on-adaptation-and-resilience

28 For more information on NWP Expert Group on Oceans, see: https://www4.unfccc.int/sites/NWPStaging/Pages/NWP-Expert-Group-on-Oceans.aspx

29 Relevant publications on technology, finance and advice for NAP development include: Enhancing resilience of oceans, coastal areas and ecosystems through collaborative partnerships (2021), Policy Brief on Innovative Approaches for Strengthening Coastal and Ocean Adaptation: Integrating Technology and Nature-based Solutions (2022), and "Coastal adaptation and nature-based solutions for the implementation of NAPs: Considerations for GCF proposal development. A supplement to the UNFCCC NAP technical guidelines (2021).

30 Refer to the OD2023 Information Note

31 Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104.

32 UNFCCC Secretariat. 2022. Summary report on the first meeting of the technical dialogue of the first global stocktake under the Paris Agreement. Available at: https://unfccc.int/sites/default/files/resource/GST%20TD1_1_sreport_26_09_2022_Final.pdf

33 UNFCCC Secretariat. 2023. Summary report following the second meeting of the technical dialogue of the first global stocktake under the Paris Agreement. Available at: https://unfccc.int/sites/default/files/resource/TD1.2_GST_SummaryReport.pdf

34 UNFCCC Secretariat. 2023. Summary report on the third meeting of the technical dialogue of the first global stocktake under the Paris Agreement. Available at: https://unfccc.int/documents/631052

CMA5, the co-facilitators of the Ocean and Climate Change Dialogue 2023 emphasised the need to strengthen the role of ocean-based climate action within the GST process. They further stated that enhancing international cooperation for ocean-based climate action is necessary if we are to achieve our common climate change goals. Looking ahead to COP 28, the co-facilitators urged that the ocean be placed within the GST outcomes and that all Parties incorporate more 'blue' in their climate commitments.

In the 2023 Synthesis report on GST element prepared by the Secretariat,[35] ocean-related submissions from Parties and non-Party stakeholders constitute almost half of the total submissions. Submissions have recognized and welcomed the work of the ocean-climate dialogue and reiterated the invitation in decision 1/CP.26 para. 60 to integrate and strengthen ocean-based action. The key messages on the GST submissions on the ocean are well-aligned with the ocean dialogue informal summary report key messages.[36] The graphs below summarize the most common key words used by Parties and non-Party stakeholders in their ocean related GST submissions.

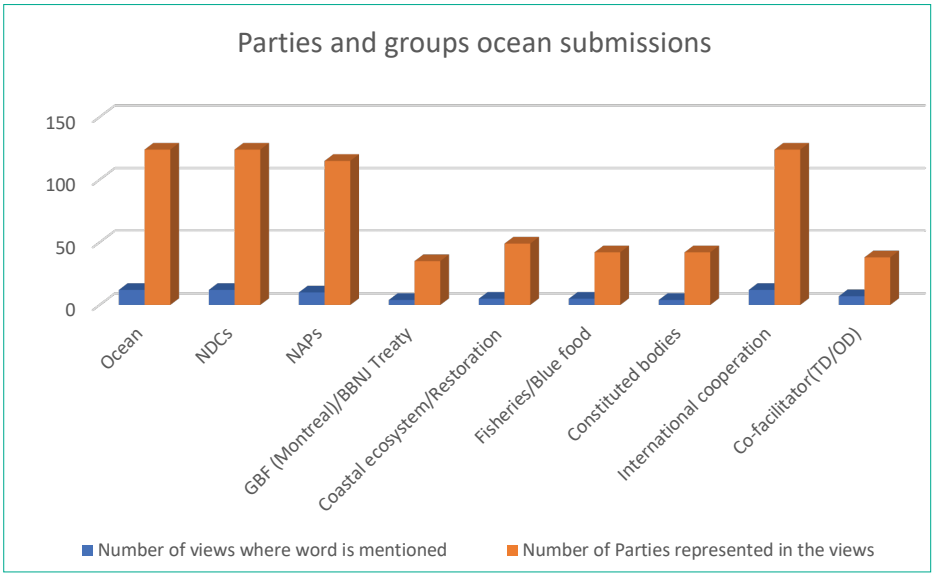

Figure 1. The most common key words used in ocean related Global Stocktake submissions by Parties and groups

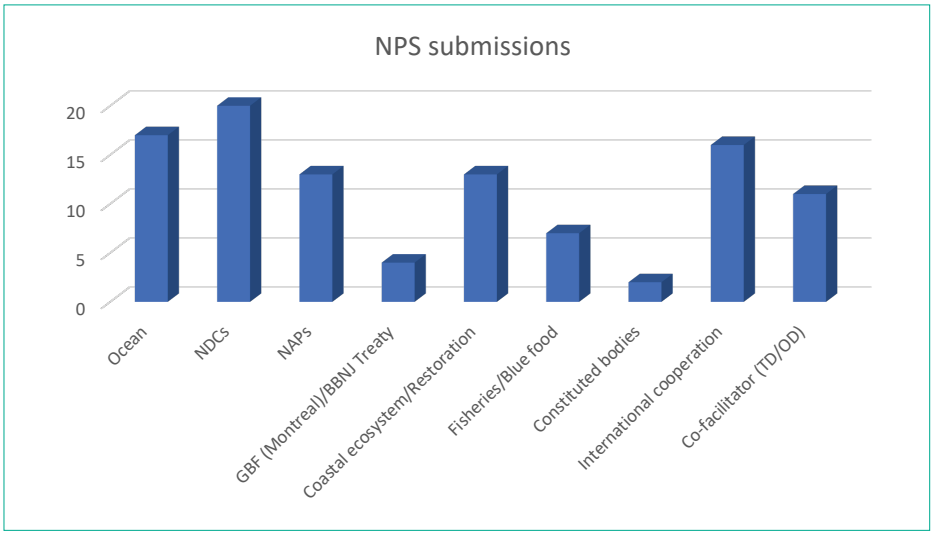

Figure 2. The most common key words used in ocean related Global Stocktake submissions by non-Party stakeholders

1.3 Progress on the Marrakech Partnership on Global Climate Action

This section reports on progress related to initiatives under the Marrakech Partnership on Global Climate Action on Oceans and Coastal Zones that occurred during 2022 and 2023.

Under the leadership of the High-Level Climate Champions (HLC), the Marrakech Partnership for Global Climate Action (MP-GCA) acts as a framework to foster enthusiasm and help accelerate the pace and scale of climate action. It especially aims at strengthening and nurturing the mobilisation of non-state actors and their collaboration with Parties to the UNFCCC. The MP-GCA Ocean & Coastal Zones brings together 120 organisations - including NGOs, the private sector, indigenous populations, research and academic institutes, and international organisations.

The ocean remains an untapped source of potential solutions to tackle the biggest challenges of our time, including the climate and biodiversity crises. Leading the way, the Ocean & Coastal Zones community under the MP-GCA, with the support of the UN Climate Change HLC, is devising a set of ocean pathways to drive the transition towards a net-zero world, and further anchor the ocean in climate and biodiversity negotiations.

35 Available at: https://unfccc.int/sites/default/files/resource/SYR_Views%20on%20%20Elements%20for%20CoO.pdf

36 The key messages on the ocean related GST submissions as summarised in the synthesis report include: Integration of the ocean-based and nature-based measures in updated NDCs and national strategies; enhancing international cooperation in ocean-based action including on the ocean dialogue Topics 1 and 2; increasing synergies in Parties action on biodiversity and ocean through the adoption of the GBF and BBNJ treaty; strengthening of ocean-based systematic observation, research, and data management; due consideration to recommendations of the 2018 IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, three IPCC Working Group Reports, and the 2023 IPCC AR6 Synthesis Report; recognition of mitigation co-benefits stemming from ocean-based adaptation actions; adopting appropriate policies, preserving and restoring oceans, coastal ecosystem and blue carbon ecosystems as a contribution to carbon storage and sequestration; mobilisation of finance towards ocean-based climate solutions; and, provide enhanced capacity building support to developing countries including on ocean acidification and other slow-onset climatic events.

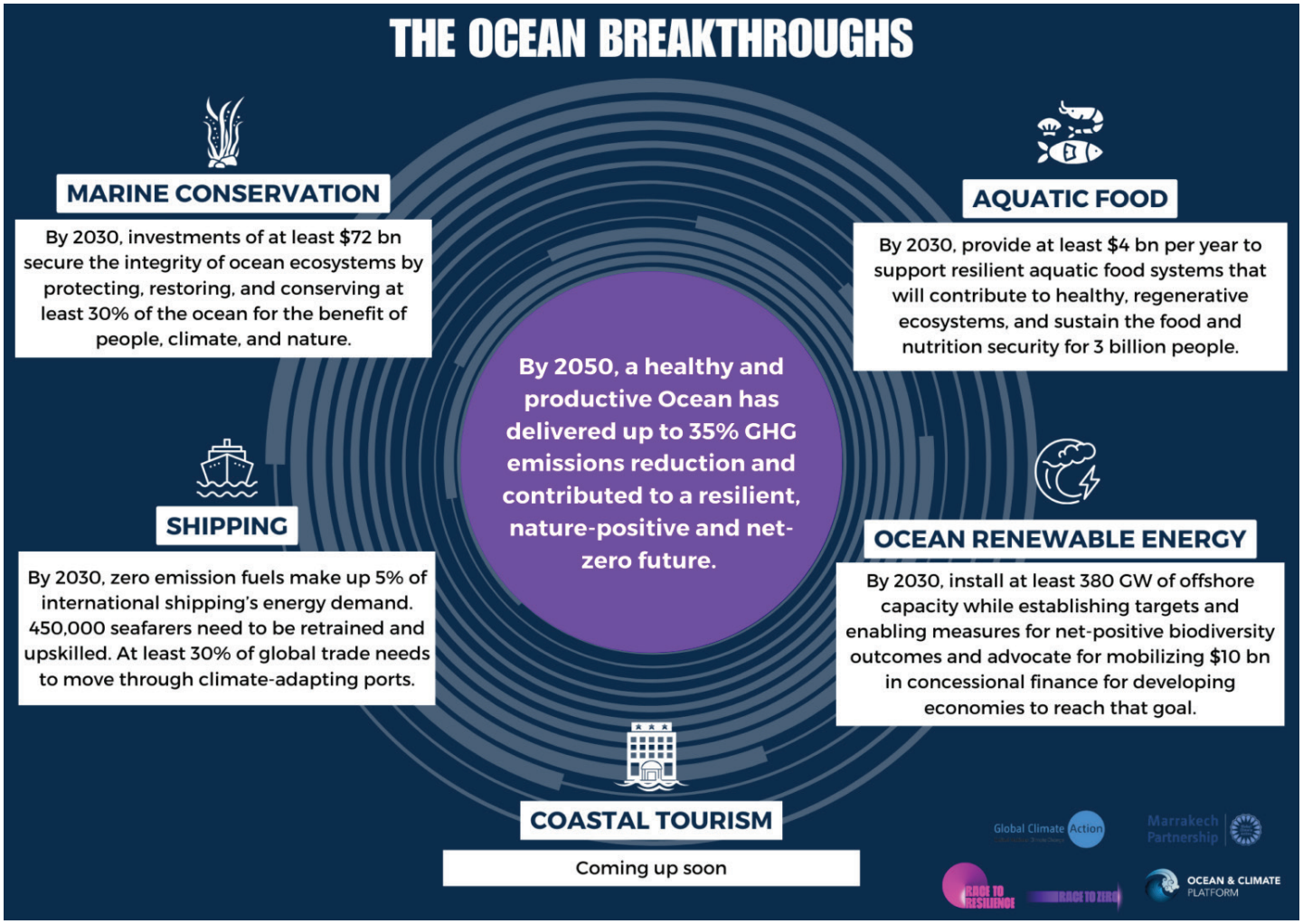

Figure 3. The ocean breakthroughs

"In the vast expanse of our ocean lies the potential for a brighter, more resilient and nature-rich world. Today, at the IUCN Leaders Forum, I am honoured to introduce the Ocean Breakthroughs -- a science-aligned blueprint which will see five pivotal sectors converge to make over a third of the emissions cuts we so greatly need. Let's dive deep and unite in purpose for the world we hold dear."

H.E. Razan Al Mubarak,
UN High-Level Climate Champion for COP28.

Building on the Ocean for Climate Declaration,[37] signed by 120 organisations at COP26 in Glasgow, the Ocean Breakthroughs identify turning points to reach by 2030 to achieve a healthy and productive ocean in 2050 in five key sectors: 1) marine conservation; 2) ocean renewable energy; 3) ocean-based transport; 4) aquatic food; and 5) coastal tourism. Accelerated action and investments in each could deliver up to 35 percent GHG emissions reduction[38] and contribute to a resilient, nature-positive and net zero future by 2050.

The scientific evidence is clear: as a major climate regulator and the largest living space on Earth, the ocean is instrumental to help achieve the goals of the Paris Agreement and the GBF. The Ocean Breakthroughs are science-based targets designed to boost mitigation and adaptation efforts for the benefit of both people and the natural world. They will contribute to delivering on the global campaigns led by the UN Climate Change High-Level Champions, namely the Race to Resilience and Race to Zero, and their respective action agendas: the Sharm-El-Sheikh Adaptation Agenda and the 2030 Breakthroughs.[39]

With this set of sectoral pathways, the Marrakech Partnership on Ocean & Coastal Zones outlines a roadmap for transformative and ambitious action at the scale of entire systems. In addition, the Ocean Breakthroughs will act as a compass, both for non-State actors (NSA) and Governments. Indeed, they are rooted in the "Blue Ambition Loop"[40] which demonstrates how strong lead-

37 The Ocean for Climate Declaration. 2021. A healthy and productive ocean for a resilient, nature-positive and net-zero future. Available online at https://climatechampions.unfccc.int/wp-content/uploads/2022/04/The-Ocean-for-Climate-Declaration-V9-16.12.2021.pdf .

38 Hoegh-Guldberg, O., Northrop, E. et al. 2023. "The ocean as a solution to climate change:
Updated opportunities for action." Special Report. Washington, DC: World Resources Institute. Available
online at https://oceanpanel.org/publication/ocean-solutions-to-climate-change

39 2030 Breakthroughs are business-led mitigation targets launched at COP26. Available at: https://racetozero.unfccc.int/wp-content/uploads/2021/09/2030-breakthroughs-upgrading-our-systems-together.pdf

40 Blue Ambition Loop Report. 2022. Achieving Ambitious 2030 Ocean-Climate Action, Non-State Actor Ambition towards Net Zero and a Resilient Ocean Economy. World Resources Institute, Climate Champions, Ocean & Climate Platform, Global Ocean Trust.

ership from NSA can positively influence governments and drive more ambitious public policies. The effective deployment of this vision relies on the close collaboration of stakeholders across sectors, a cross-cutting approach and key underlying components (i.e., Science, Finance, Governance, and Inclusivity) to define objectives and quantifiable targets.

Ultimately, the Ocean Breakthroughs aim at informing the GST to ensure the potential of ocean-based climate solutions is well recognised in the outcomes of the process to resume at COP28. Building on a whole-of-society approach, it must be all hands on-deck to achieve the goals of the Paris Agreement and safeguard our Blue Planet.

1.4 Progress with the mobilization of UNFCCC Friends of the Ocean and Climate and associated actions

The Friends of the Ocean and Climate (FOOC) group, which Ocean Conservancy has been supporting as the Acting Secretariat since 2019, is an informal and inclusive group that provides a space for Parties and civil society organizations to discuss how to advance ocean-climate action in the UNFCCC and how to integrate ocean-climate nexus work across international fora. The FOOC aims to set a global standard for ambitious ocean-climate stewardship and ensure ocean and coastal communities' concerns are integrated into international climate discussions. Since 2017, the FOOC has championed efforts to secure a space for the ocean in the UNFCCC, including the creation of the Ocean and Climate Change Dialogue. To accomplish this, the group has helped Parties prepare for negotiations at COP, coordinating with non-governmental organizations (NGO) to support these efforts. Over the last few years, the FOOC has organized events at different venues including the UNFCCC COPs, SBSTA58 Ocean and Climate Change Dialogue, New York Climate Week, and the UN Ocean Conferences. At each of these events, the FOOC has provided different perspectives to countries interested in implementing ocean-climate actions as part of their climate strategies, as well as encouraged synergies across the various fora.

The original goal of the FOOC was to initiate a dedicated discussion that would lead to inclusive dialogues within the UNFCCC to address the threat that climate change poses to the ocean, as well as to support efforts to maintain a healthy ocean. The FOOC was instrumental in securing the mandate for the Ocean and Climate Change Dialogue during COP25 in Madrid in 2019 (the "Blue COP") and spearheaded discussions at COP26 and COP27 that led to the Dialogue's evolution into its current format.

Today, the FOOC continues to work in an inclusive manner to support efforts relating to: 1) mobilizing concrete ocean-based climate solutions and their inclusion in NDCs, NAPs, and other climate communications; 2) supporting efforts for the inclusion of the ocean across UNFCCC processes, such as the GST; 3) creating synergies for the ocean-climate nexus across international fora; and 4) identifying and promoting the enabling conditions that support the implementation of such actions (e.g. financing, policy gaps).

High-level political engagements hosted by the Friends of the Ocean and Climate Group (2021-2023)

The FOOC has helped mobilize high-level political support for negotiations, encouraged momentum for ocean-climate actions, developed and expanded international leadership on ocean-climate action, and helped integrate the ocean-climate nexus priorities across international fora with events such as high-level dinners at COP26 (Glasgow, 2021), UN Ocean Conference (Lisbon, 2022), COP27 (Sharm El-Sheikh, 2022), and high-level receptions at the International Renewable Energy Agency Annual Assembly (Abu Dhabi, 2023), and SBSTA58's Ocean and Climate Change Dialogue (Bonn, 2023) supported by partners Oceano Azul Foundation, UN Foundation, Ocean & Climate Platform and Ocean Conservancy.

Driving ocean-climate action at the Ocean and Climate Change Dialogue (May 2023)

This preparatory meeting for Parties helped to identify priorities and coordinate ahead of the SBSTA58 Dialogue in 2023. The discussion focused on how to make the Ocean and Climate Change Dialogue a platform to mobilize concrete ocean-climate action around the two topics identified for the Dialogue, including: 1) coastal ecosystem restoration, including blue carbon; and 2) and fisheries and food security. The discussion also helped reactivate the group of Parties championing ocean-climate actions in the UNFCCC context, as this was the first time they had come together since COP27.

Driving action at the Ocean and Climate Change COP28 Preparatory Meetings Series (September-November 2023)

This series of three meetings helped UNFCCC Parties and NGOs coordinate priorities and actions ahead of COP28. The goal of the first meeting in September 2023 was to reflect on the key outcomes of the Ocean and Climate Change Dialogue and launch a discussion to identify ocean-climate nexus priorities that the collective could

help advance at COP28. During this meeting, Parties and NGOs highlighted the importance of working towards better integration of ocean-climate priorities across the UNFCCC by including the ocean as a key element of the GST and exploring synergies with other international processes including the Kunming-Montreal GBF and the BBNJ Agreement.

The second meeting was held in October 2023 and was a dedicated session for Parties to share views, priorities, and discuss and coordinate actions. The third meeting is scheduled to be held in November 2023 and will be an inclusive gathering of Parties and non-governmental organizations focusing on finalizing plans for COP28 and coordinating support for the priorities identified by the group.

1.5 Progress in other fora outside of the UNFCCC

Much progress has been made on advancing the ocean-climate nexus in fora outside of the UNFCCC. This section reports on: 1) the recent work of the High-Level Panel for a Sustainable Ocean Economy, as it relates to climate change; 2) the recent BBNJ Agreement adopted in June 2023; 3) the adoption of the Convention on Biodiversity (CBD) Montreal-Kunming Global Biodiversity Framework in December 2022; 4) the UN Ocean Conference held in June 2022; and 5) the High-Level Political Forum on Sustainable Development (5-15 July, 2022 and 10-19 July, 2023). The prospect of an Intergovernmental Panel of Ocean Sustainability (IPOS), whose establishment was called for at the 2022 UN Ocean Conference, and the subsequent Seascape Assessment, which commenced at the beginning of 2023, are also examined in this section.

Establishment of the International Panel for Ocean Sustainability

The International Panel for Ocean Sustainability (IPOS), an initiative co-developed by F. Gaill and T. Rudolph, aims at reinventing the interface between ocean knowledge and political action. The IPOS will function as a central hub for synthesizing and sharing ocean science while fostering ongoing dialogues to turn knowledge into action. This inclusive approach spans from regional entities to local communities and from global corporations to small-scale fishermen. It establishes a dynamic two-way communication channel where information is shared constructively. As it is stated in the original paper presenting the concept of an IPOS, different options were envisioned regarding the scope of the IPOS: *"Given the urgency to address critical ocean priorities, an international panel may (in the shorter term at least) offer the benefits of speed, flexibility, and autonomy".*[41] Nonetheless, an evolution of the IPOS towards the intergovernmental science-policy interface for ocean sustainability promoted by the EU in its International Ocean Governance agenda remains highly possible for the future of the IPOS.

More coherence and directionality are required to build the pathways to ocean sustainability. In August 2023 the Ocean Sustainability Foundation, hosted by the CNRS Foundation and dedicated to guarantee the launch of the IPOS at the 2025 UN Ocean Conference in Nice, released a Seascape Assessment (commissioned by EU Directorate-General for Maritime Affairs and Fisheries) of ocean coverage in Global Environmental Assessments (GEAs). This first volume of the Seascape Assessment demonstrated that these global efforts do not provide a comprehensive evidentiary basis to support sustainable ocean decision-making. The IPOS looks forward to developing and proposing robust strategies to effectively address gaps that block harmonized collaboration across systems. This new mechanism focuses on revitalizing and valuing the interactions among scientists, policymakers, public authorities, ocean users, indigenous people and local communities. It encourages the involvement of academic sciences, technology, and implementation experience to generate pertinent and actionable proposals in the global ocean debate.

The core project initiatives are the "IPOS Labs," designed as a Real-world Laboratory embodying a transdisciplinary and participatory methodology. Action is stimulated through the co-design, co-production and co-evaluation of inclusive, forward thinking, coordinated and actionable solutions. These feed into an IPOS data platform, which establishes an open-access repository for peer-reviewed scientific ocean knowledge. This platform will integrate findings from IPOS Labs and employ artificial intelligence (AI) to link with established ocean data networks.

In summary, the IPOS does not intend to replace any existing mechanisms in the current ocean governance landscape. Instead, it is intended to serve as a forum to integrate and synthesize collective ocean knowledge and act as a bridge between knowledge and action, providing comprehensive and facilitated summaries and actionable recommendations tailored to decision-makers' priorities. It is intended to support the anticipation of trade-offs, consider responses from civil society and industry, and assess implementation costs. Through innovative methodologies, IPOS will offer easy-to-access, digital and

41 Gaill, F., Brodie Rudolph, T., Lebleu, L. et al. 2022. An evolution towards scientific consensus for a sustainable ocean future. npj Ocean Sustain 1, 7. https://doi.org/10.1038/s44183-022-00007-1

agile tools to centralize knowledge, science, and lessons learned - thereby accelerating the learning process. The IPOS is intended to convert the insights acquired through engagement with diverse stakeholders into tangible actions for adaptation and response, while also supporting visioning exercises to explore future ocean scenarios.

The Kunming-Montreal Global Biodiversity Framework

In December 2022, the Conference of the Parties to the Convention on Biodiversity Diversity adopted, at its fifteenth meeting (CBD COP15), the Kunming-Montreal Global Biodiversity Framework.[42] This new Framework, developed following the expiry of the Aichi Biodiversity Targets (2010-2020), contains a set of 4 outcome-oriented goals[43] (2050 deadline) and 23 action-oriented targets (2030 deadline). It represents the most ambitious global goals and targets for nature ever adopted by governments.[44] The goals and targets of the Framework are crafted to be generic and applicable to all biomes, outlining the need to take more holistic and comprehensive approaches to conserving and sustainably using biodiversity. In addition to the well-known 30 by 30 target (target 3; calling for conservation of 30% of the ocean by 2030), the Framework also contains targets focused on spatial planning (target 1), restoration of 30% of degraded ecosystems by 2030 (target 2), sustainable use of wild species and areas of under aquaculture and fisheries (targets 5, 9 and 10), invasive alien species (target 6), pollution (target 7) and includes a specific target focused on climate change and ocean acidification as follows:

"Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster-risk reduction actions, including through nature-based solutions and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity." [45]

Parties are now updating and/or revising their National Biodiversity Strategies and Action Plans (NBSAPs) to translate the targets of the Framework to their countries. In developing the Framework, Parties emphasized the importance of taking a holistic and comprehensive approach to implementation. They stressed the need to create synergies across implementation efforts, avoid duplication of efforts and fragmentation of resources, and ensure that all the drivers of biodiversity loss are addressed. Further, the actions called for in the targets of the Framework are highly broad-reaching and cross-cutting, and the Framework itself emphasizes that the success of the Framework "…requires political will and recognition at the highest level of government and relies on action and cooperation by all levels of government and by all actors of society." (Section G, para 7(c)).[46]

The General Assembly of the United Nations Resolution on Oceans and the Law of the Sea

The General Assembly of the United Nations (UNGA) has consistently underlined that the adverse effects of climate change on the marine environment and marine biodiversity are a serious concern and emphasized the urgency of addressing these effects. In its most recent

42 UNEP CBD. 2022. Kunming-Montreal Global biodiversity framework. CBD/COP/15/L.25. Available at: https://www.cbd.int/doc/c/e6d3/cd1d/daf663719a03902a9b116c34/cop-15-l-25-en.pdf

43 Ibid. Also available online at: https://www.cbd.int/gbf/goals/

44 Ibid. Also available at: https://www.cbd.int/gbf/targets/

45 Ibid.

46 Ibid.

resolution on oceans and the Law of the Sea, the UNGA specified that the current and projected adverse effects of climate change on the marine environment and marine biodiversity include rising seawater temperature, ocean deoxygenation, sea-level rise, and ocean acidification. The resolution also highlighted the importance of preserving the ocean as a carbon sink.[47]

In the resolution, the UNGA called upon States to enhance their efforts to reduce the emission of greenhouse gases (GHG), to reduce the projected adverse effects of climate change on the marine environment and marine biodiversity. In this context, an increasingly greater emphasis has been put on scientific research, and the need for States to enhance their scientific activity to better understand the effects of climate change on the marine environment and marine biodiversity. The UNGA has noted the vital role that coastal blue carbon ecosystems play in climate adaptation and mitigation through carbon sequestration, as well as in increasing the resilience of coastal ecosystems to ocean acidification. It has encouraged States and relevant international institutions and organizations to work collaboratively to protect and restore coastal blue carbon ecosystems. Further, it has also called upon States and international institutions to support and strengthen capacity-building activities in developing countries, in particular least developed-countries and small island developing States (SIDS), in the area of mitigation of and adaptation to climate change impacts on the ocean (including coastal protection against sea-level rise).

Further, the UNGA has established the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects (herein referred to as the Regular Process) which aims to provide regular assessments of the state of the ocean.[48] The outcome of the second cycle of the Regular Process in 2020 included the Second World Ocean Assessment, with climate change-related components, and policy briefs prepared by the Group of Experts of the Regular Process.[49] These assessments provide scientific evidence on the impacts of climate change and related changes in the atmosphere and the ocean.

In relation to sustainable fisheries, the UNGA has consistently expressed its concern over current and projected adverse effects of climate change and ocean acidification on food security and the sustainability of fisheries. It has continued to do so in its annual sustainable fisheries resolution, reiterating this concern most recently in resolution 77/118 of December 9, 2022.[50]

Regarding marine biodiversity, the recently adopted Agreement under the United Nations Convention on the Law of the Sea (UNCLOS) on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ Agreement) should make vital inroads in addressing the triple planetary crisis of climate change, biodiversity loss, and pollution. The Agreement addresses the impacts of climate change and ocean acidification in a variety of ways and recognizes the need to address biological diversity loss and degradation of ocean ecosystems in a coherent and cooperative manner. Climate change impacts on marine ecosystems are wide-ranging and magnified by additional stressors, such as ocean acidification, pollution, and unsustainable use. It is critical to build ecosystem resilience and maintain and restore ecosystem integrity, including carbon cycling services that underpin the role of the ocean in climate. In accordance with the general principles and approaches set out in the draft BBNJ agreement, its Parties shall be guided by this approach.[51]

Since the adoption of the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs), heads of State and Government and high-level representatives have met twice to support the implementation of SDG 14, first in New York in June 2017, and again in Lisbon in June/July 2022. SDG 14 is dedicated to the conservation and sustainable use of the oceans, seas and marine resources for sustainable development. One of its associated targets focuses on minimizing and addressing the impacts of ocean acidification, including through enhanced scientific cooperation at all levels.

In 2022, the United Nations Ocean Conference reaffirmed that climate change was one of the greatest challenges of our time and expressed alarm at the adverse effects of climate change on the ocean and marine life. In addition to the adverse effects listed in the 2017 conference resolution, the 2022 resolution also mentioned shifts in the abundance and distribution of marine species and the decrease in marine biodiversity. The Conference also emphasized the importance of implementing the Paris Agreement adopted under the Convention and welcomed ocean-related decisions taken by Parties to this Convention.[52]

47 UN General Assembly. 2022. Resolution on Oceans and the Law of the Sea. (A/RES/77/248).

48 UN General Assembly. 2003. Resolution on Oceans and the Law of the Sea. (A/RES/58/240).

49 United Nations. 2020. Ad Hoc Working Group of the Whole on the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects, addressed to the President of the General Assembly. Letter. https://digitallibrary.un.org/record/3888191?ln=en; United Nations. 2022. Brief on the Second World Ocean Assessment and Climate Change in the Ocean.

50 UN General Assembly. 2022. Resolution on Oceans and the law of the sea: sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments(A/RES/77/118).

51 UN General Assembly. 2023. Agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. (A/CONF.232/2023/4)

52 United Nations. 2022. Report of the 2022 United Nations Conference to Support

The UN Division for Ocean Affairs and the Law of the Sea (DOALOS), in addition to supporting the work of the processes outlined above, continues to implement an extensive program of capacity-building activities on ocean governance and the regulatory framework under UNCLOS and related instruments. This program is essential to ensuring the proper management of ocean spaces and the protection and preservation of the marine environment. As the entity providing interim secretariat functions for the recently adopted BBNJ Agreement until the permanent secretariat is established, DOALOS will also be providing support to States in becoming parties to, and implementing, the Agreement. Assistance to States in ensuring its early entry into force and effective implementation can drive motivation in the ocean-climate space.

Finally, it is also important to note that the Commission of Small Island States on Climate Change and International Law requested an advisory opinion from the International Tribunal for the Law of the Sea on the obligations of States Parties under UNCLOS on the effects of climate change on the ocean.[53] In addition, the UNGA requested an advisory opinion from the International Court of Justice on the obligations of States in respect of climate change, including under the Law of the Sea.[54]

UN Ocean Decade – 'The United Nations Decade of Ocean Science for Sustainable Development'

The United Nations Decade of Ocean Science for Sustainable Development (herein referred to as the "Ocean Decade") is a once in a lifetime opportunity to deliver a step-change in the generation and use of ocean science.[55] The focus of the Ocean Decade is on solutions-oriented science that fills critical knowledge gaps to inform global and regional policy processes, including processes of the UNFCCC, and to facilitate understanding needed by governments, industry, and resource managers amongst others. It does so by recognizing that the ocean fundamentally influences many aspects of our society and that achieving SDG 14 will have far-reaching positive impacts on the greatest challenges we face today.

Through its Decade Implementation Plan, the Ocean Decade outlines ten Decade Challenges that represent the most immediate and pressing needs over the next decade.[56] Challenge 5 focuses on enhancing the understanding of the ocean-climate nexus and generating knowledge and solutions to mitigate, adapt and build resilience to the effects of climate change across all geographies and at all scales. It also recommends improving services for prediction for the ocean, climate and weather.[57] Working towards the achievement of Challenge 5 is central to addressing the other nine Decade Challenges and the Decade Outcomes.

The complex and interconnected nature of ocean-related issues demands coordinated efforts across borders, disciplines, and sectors. By working together, sharing knowledge, and pooling resources, stakeholders can maximize their impact and address the multifaceted challenges facing our oceans. This collaborative spirit is at the core of the Ocean Decade fostering a global community dedicated to advancing our understanding of the ocean and ensuring its long-term health and sustainability. Recognizing the fundamental role of stakeholders and partners in achieving 'the ocean we want', the Decade Implementation Plan emphasizes their collaborative efforts in co-designing and co-delivering a wide range of tangible initiatives known as Decade Actions.

As of September 2023, a total of 409 Decade Actions have been endorsed, further subdivided into 47 Programmes, 85 Contributions, and 277 Projects. These Decade Actions were selected for: 1) their transformative nature; 2) their solutions-oriented focus that will result in tangible contributions to sustainable development; and 3) their commitment to Ocean Decade principles including inclusivity and diversity. The Decade Actions cover diverse themes including climate resilience and mitigation, ocean science to support policy development in SIDS, ocean literacy, deep-sea research and management, ecosystem management under multiple ocean stressors including ocean acidification and deoxygenation, protection of underwater cultural heritage, ocean observations, coastal resilience, and fisheries. The fifth Call for Decade Actions closed on 31 August 2023 and the sixth one was launched on 15 October 2023.

The plethora of Decade Actions specifically focusing on catalyzing ocean-climate solutions include two UN Ocean Decade Collaborative Centers (DCC) on Ocean-Climate Solutions and Ocean-Climate Nexus. These DCCs lead and support processes to co-design, develop, test and deliver scalable and equitable ocean-based solutions to mitigate and reverse the effects of climate change. The Blue Climate Initiative (BCI) is an innovative program hosted by these DCCs. BCI brings to-

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the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development. A/CONF.230.2022/14, page 6 (Resolution 1).

53 United Nations. 2023. ITLOS/PV.23/C31/4 https://itlos.org/fileadmin/itlos/documents/cases/31/Oral_proceedings/ITLOS_PV23_C31_4_E.pdf

54 UN General Assembly. 2023. Resolution on a Request for an advisory opinion of the International Court of
Justice on the obligations of States in respect of climate change (A/RES/77/276). See all relevant documents at https://www.icj-cij.org/case/187

55 The science we need for the ocean we want. Ocean Decade. 2023. https://oceandecade.org/

56 Ocean Decade Challenges. Ocean Decade. 2023. https://oceandecade.org/challenges/

57 Ibid.

gether scientists, communities, engineers, entrepreneurs, investors, global leaders and influencers harnessing innovation and traditional knowledge to reimagine, catalyse, and scale ocean-related strategies to combat climate change while protecting our ocean. BCI work focuses on solutions to urgent global challenges including improved human health, sustainable food supplies, renewable energy, flourishing biodiversity, stewardship of the ocean's resources, and vibrant ocean economies.

Also of note is the Global Ocean Oxygen Decade (GOOD)[58] which aims at raising global awareness about ocean deoxygenation. GOOD efforts will develop mitigation and adaptation strategies and solutions to ensure continued provision of ecosystem services. Additionally, GOOD will minimize negative impacts on the ocean economy through local, regional, and global efforts, including transdisciplinary research, innovative outreach, and ocean education and literacy.

Other relevant programmes focusing on the ocean-climate nexus include:

1. **Observing Air-Sea Interactions Strategy (OASIS) Programme:**[59] Provides observational-based knowledge to fundamentally improve weather, climate and ocean prediction, promote healthy oceans, the blue economy, and sustainable food and energy;
2. **Global Ocean Negative Carbon Emissions (Global-ONCE) Programme:**[60] Provides the science required to evaluate and implement eco-technological interventions, including learning from paleo-oceanic carbon processes to predict the future, restoring impacted marine ecosystems, fostering nature-based systems of land-sea integrated management, upwelling manipulation, microbial-driven comprehensive carbon sequestration, adjustment of nutrients, DO and pH; and
3. **Global Ocean Decade Programme for Blue Carbon (GO-BC):**[61] Enhances understanding of the ocean-climate nexus and generate new knowledge and solutions to mitigate the effects of climate change recognising the multiple roles blue carbon ecosystems play beyond mitigation, including adaptation and resilience to the effects of climate change.

Furthermore, an interactive online platform called the Ocean Decade Network[62] enables people from around the world, across multiple demographics, to engage actively with the Ocean Decade. This platform also acts as a common digital space for the global community of ocean-minded professionals. Resources on the platform such as the 'Ocean-Climate Solutions and Innovations Network' connect multi-sector stakeholders to leverage expertise and mobilize resources for ocean-climate innovations and solutions by facilitating the sharing of project outcomes, best practices, noteworthy news, events, opportunities, and ideas.

The Vision 2030 process launched in the third year of implementation the Ocean Decade. It is a strategic ambition-setting process to identify a shared measure of success for each of the Ocean Decade Challenges, including Challenge 5, on the road to 2030.[63] The Vision 2030 process is intended to the answer the question: 'What does success look like for the Challenges at the end of the Decade?' It will further take stock of current trends, gaps, and priority user needs to identify key targets and milestones to measure progress and enhance the collective impact of the Ocean Decade.

Through concrete indicators and methodologies, the Vision 2030 process contributes to the evaluation of the impact of the Ocean Decade, identifies resource mobilization priorities, and ensures the ongoing relevance of the Challenges over time. The first key outcome of the process will be a set of white papers on the 10 Challenges, as well as a synthesis report addressing linkages across the Challenges. Draft versions of these papers will be shared for broad review and input. The final draft versions will be presented and discussed during thematic 'Science Solution Forums' at the 2024 Ocean Decade Conference – creating a global platform for stakeholders to engage, share insights, and collectively advance the implementation of the Ocean Decade Challenges.

The 2024 Ocean Decade Conference, which will be hosted by the Government of Spain in Barcelona from 10 - 12 April 2024, will bring together the global Ocean Decade community and partners to celebrate and take stock of progress, and set joint priorities for the future. An important milestone on the path to 2030, the event will cover the full range of Ocean Decade Challenges including critical issues such as climate change, food security, sustainable management of biodiversity, sustainable ocean economy, pollution, and natural hazards. Over three days, the Conference will create a new foundation to strengthen the sustainable management of the ocean

58 IOC-UNESCO. 2023. Global Ocean Oxygen Decade (GOOD) Programme. https://www.ioc.unesco.org/en/global-ocean-oxygen-decade#:~:text=Contacts-,What%20is%20the%20Global%20Ocean%20Oxygen%20Decade%20(GOOD)%20Programme%3F,Oxygen%20Network%20of%20IOC%2DUNESCO

59 Cronin, M. F., Swart, S., Marandino, C. A., Anderson, C., Browne, P., Chen, S., ... & Yu, L. 2023. Developing an observing air–sea interactions strategy (OASIS) for the Global Ocean. ICES Journal of Marine Science, 80(2), 367-373.

60 Ocean Negative Carbon Emissions. 2022. About ONCE. https://once.xmu.edu.cn

61 Global Ocean Decade Programme for Blue Carbon. 2022. https://oceandecade.org/actions/global-ocean-decade-programme-for-blue-carbon/

62 The Ocean Decade: The Ocean Decade Network. https://forum.oceandecade.org

63 Vision 2030: Ocean Decade Launches New Global Ambition-Setting Process. (n.d.). https://oceandecade.org/news/vision-2030-ocean-decade-launches-new-global-ambition-setting-process/

and drive science-based innovation. With a range from global to local, it is intended to leave no one behind.

The generation, sharing, and management of ocean data, information and knowledge are cornerstones for the Ocean Decade's expected success. However, the rapid but uncoordinated growth in the number and diversity of ocean data sources unintentionally hinders the effective discovery of, and access to, information needed to address the Ocean Decade Challenges. Additionally, there are still major gaps in ocean data and other digital resources.

The Ocean Decade's Data and Information Strategy (published April 2023) will enable a globally distributed, trusted, inclusive, and interconnected ocean data and information system. Building on existing observing systems, platforms and strategies, the Data and Information Strategy will be actively used for decision-making to support sustainable management, including climate change adaptation and mitigation measures.[64] For ocean science, this will facilitate the identification and sharing of multidisciplinary data and information. The Ocean Decade's Data Strategy Implementation Group is currently developing a detailed action plan that will enable the ocean science community to achieve this strategic goal by 2030.

UN Ocean Conference

The UN Ocean Conference (UNOC) 2022, co-hosted by Portugal and Kenya, was the second iteration of this Conference and demonstrated a strong mobilization of ocean actors, despite occurring during the latter stages of the COVID-19 pandemic. Given that 2022 was entitled the "Super Year for the Ocean," expectations were high. Civil society was well represented, with a marked increase on the UNOC of 2017. Though the level of political will was perhaps not equal to that which civil society was calling for, success of the Conference can be directly and indirectly attributed as it acted as a lodestone (in essence, a point of focus with which to push forward progress on key issues).

Topics where political progress was made as a result of the gathering in Lisbon included: a) seabed mining, with countries being vocal on their position against the initiation of this harmful practice; and b) high seas treaty conclusion, with impending negotiations and 30 by 30 with the similarly impending Global Biodiversity Framework. As such, although the UNOC's own political conclusions can be seen as more of the same, the momentum generated and the nexus of government and civil partners created an opportunity to move the needle on some key issues, that resulted in subsequent tangible success across biodiversity, high seas and deep-sea mining topics. Now, with a third UNOC mandated, and Nice on the horizon for 2025, the opportunity should not be missed to utilize this ocean forum to foster meaningful political progress on advancing ocean issues within the international agenda.

UN Food Systems Summit

In 2021, the UN hosted the first ever Food Systems Summit (UNFSS), with an in-person pre-summit in July in Rome, and a virtual summit in New York in September. The preparations for the Summit were organized into five separate Action Tracks (nutrition, sustainable consumption, nature-positive production, equitable livelihoods, and resilience) and supported by a Scientific Group. During the Summit, several action coalitions were formed that were intended to take the Summit outcomes into action.

Despite the ocean's critical role in supplying protein and essential micronutrients and fatty acids to billions of people and supporting the livelihoods of millions of small-scale fishers and fish farmers in coastal communities, there was not much initial consideration to ocean and aquatic food sources in the early stages of the Food Systems Summit. Several Parties and NGOs, supported by new evidence from the recently launched 'Blue Food Assessment',[65] mobilized to ensure aquatic foods were integrated in the five Action Tracks and outcomes. This led to a UNFSS policy brief on the vital roles of aquatic foods in global food systems,[66] and the formation of the 'Aquatic Blue Food Coalition'.[67] The goals of the ABFC are to raise the profile of aquatic foods in discussions of the future of food systems, and to mobilize support for countries (or groups of countries) that intend to integrate aquatic foods into their food systems and to implement core aquatic food priorities.

The Aquatic Blue Food Coalition currently has over forty Party and non-party members. Since its formal launch at the UN Ocean Conference in Lisbon in 2022, it has brought together stakeholders and experts at venues like the 50th Conference on World Food Security, UNFCCC COP27, UNFCBD COP15, and the UNFSS GST. These stakeholders and experts aim to mobilize support for the integration of oceans and fisheries in efforts to address malnutrition, climate change, and biodiversity losses.

64 IOC-UNESCO. 2023. Ocean Decade Data & Information Strategy. Paris, UNESCO. (The Ocean Decade Series, 45)

65 See https://bluefood.earth

66 Research Partners of the Scientific Group for the Food Systems Summit. 2021. The Vital Roles of Blue Foods in the Global Food System. Available at: https://sc-fss2021.org/wp-content/uploads/2021/04/FSS_Brief_Blue_Economy_MT.pdf

67 Environmental Defense Fund. 2022. The Aquatic Blue Food Coalition formally launches at the UN Ocean Conference. Available at: https://www.edf.org/media/aquatic-blue-food-coalition-formally-launches-un-ocean-conference

The Coalition is currently working with its members to continue to draw the connection between – and spur investments in – food, climate, and oceans at COP28.

1.6 Other global developments

This section considers other global developments not previously mentioned. They include relevant outcomes from the Monaco Ocean Week (March 2022 and 2023), Our Ocean Conference 2022 Palau, and Our Ocean Conference 2023 Panama.

Monaco Ocean Week and Monaco Blue Initiative, 2022 and 2023 editions

The Monaco Ocean Week is organised by the Prince Albert II of Monaco Foundation, the Government of Monaco, the Oceanographic Institute of Monaco, the Scientific Centre of Monaco and the Monaco Yacht Club. It is a week completely dedicated to the ocean held every year in the Principality of Monaco. Convening from March 21 – 26, 2022 and from March 20- 26, 2023, this event brings together scientists, policy makers, business representatives, NGOs and civil society from across the globe to discuss major challenges and solutions related to ocean governance and conservation. Each edition of Monaco Ocean Week resulted in approximately 50 sub-events, focused on topics such as ocean innovation, ocean health and human health, the sustainable blue economy, scientific research and exploration, sustainable yachting, marine protected areas, legal approaches to ocean conservation, and awareness raising.

The Monaco Ocean Week kicks off with the Monaco Blue Initiative, a high-level platform for debate organized under the patronage of HSH Prince Albert II of Monaco. Representatives of Governments, international organizations, civil society, NGOs, the private sector, the scientific community and the media meet every year to explore and promote synergies between the protection of the marine environment and the development of a truly sustainable blue economy. The 2022 and 2023 editions discussed blue finance, sustainable fishing, highly protected marine protected areas (MPAs), the restoration of marine ecosystems and scaling-up solutions for the Mediterranean Sea.

The Monaco Ocean Week and the Monaco Blue Initiative provide a space for discussion and co-creation of solutions on ocean protection and governance in the lead up to major meetings of the international Ocean Agenda, such as the next UNOC, co-hosted by Costa Rica and France, which will convene in 2025 in Nice, France.

Our Ocean, Our People, Our Prosperity Conference

The seventh Our Ocean Conference, titled "Our Ocean, Our People, Our Prosperity," was held in Koror, Palau on April 13-14, 2022. Co-hosted by the Republic of Palau and the United States, the conference drew more than 600 participants representing more than 70 foreign delegations and 150 non-state actors. It was the first Our Ocean Conference to be held in a small island developing State.

The conference focused on the importance of ocean-based climate solutions, including offshore renewable energy, marine nature-based solutions (NbS), and shipping decarbonization, as well as the importance of a healthy ocean to SIDS and communities around the globe. The conference concluded with issuance of 410 commitments worth $16.35 billion to support concrete action to advance ocean issues (including ocean-climate issues).

In March 2023, the Republic of Panama became the first Central American country to host the eighth edition of The Our Ocean Conference, under the theme Our Ocean...Our Connection. The conference facilitated collaborative dialogue among Heads of State and representatives from the private sector, civil society, and academic institutions. Discussions focused on strategies to save marine resources, promote sustainable use and educate the public about the ocean. The Conference highlighted the importance of creating marine protected areas, growing sustainable blue economies and tourism, and finding innovative solutions to end marine pollution.[68]

1.7 Regional developments

This section provides updates from selected regions where collective progress on ocean and climate issues has been made. It includes the consideration of ocean and climate in regional policies and meetings, including regional developments in Africa, East Asia, the European Union and the Caribbean.

Regional developments in Africa

The African region has a combined total coastline of 30,725 km with vast inland waterways.[69] The region is home to roughly 15 percent of the world's population along with rich natural resources, with nature capital accounting for 30-50 percent of total wealth. Off the coast of Eastern Africa, the Western Indian Ocean (WIO) region harbors a highly productive system that supports over 65 million people living within 100 kilometers of

68 See UNEP Caribbean Environment Programme 2023 newsletter at: https://gefcrew.org/carrcu/CEPNewsletters/CartagenaConventionNewsletter_Edition_4_March_2023_1.pdf

69 IMO. Africa Region. https://www.imo.org/en/OurWork/TechnicalCooperation/Pages/africa.aspx

the coast. The estuarine and coastal ecosystems protect the coastline, sequester carbon dioxide, provide habitats for marine organisms, and support fishing, aquaculture, tourism, and recreation.

Unsustainable resource use coupled with increasing impacts from climate change has driven the development of varied regional, ecosystem-based management strategies, which have recognized the importance of the ocean-climate nexus.[70] In particular, fisheries management, sustainable development of the blue economy, and marine biodiversity remain at the forefront of conservation initiatives in the region.

The inaugural African Climate Summit (4-6 September 2023) was organized in parallel with Africa Climate Week (4-8 September 2023). These events were intended to offer regionally-focused contributions to inform the GST on 1) energy systems and industry; 2) cities, urban and rural settlements, infrastructure and transport; 3) land, ocean, food and water; and 4) societies, health, livelihoods, and economies. The Africa Climate Summit aimed to address the increasing exposure to climate change and its associated costs, both globally and regionally in Africa. The Summit served as a platform to inform, frame, and influence commitments, pledges, and outcomes, ultimately leading to the development of the Nairobi Declaration.

The ocean-climate nexus was recognized in the Nairobi Declaration, with three ocean-specific Declarations:

1) Further recognise the critical importance of the oceans in climate action and commitments made on ocean sustainability in multiple fora such as the Second UN Oceans Conference in 2022, and the Moroni Declaration for Ocean and Climate Action in Africa in 2023;
2) Integrate climate, biodiversity and ocean agendas into national development plans and processes to increase resilience of local communities and national economies; and
3) Promote regenerative blue economy and support implementation of the Moroni Declaration for Ocean and Climate Action in Africa, and the Great Blue Wall Initiative, while recognizing the circumstances of Africa's Island States.[71]

The Nairobi Convention provides a platform for governments, civil society, and the private sector to work together for the sustainable management and use of the marine and coastal environment.[72] Members of the Convention include Comoros, France, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, Tanzania and the Republic of South Africa. The Convention is administered by the UNEP Regional Seas Programme.

After thirteen years, Nairobi Convention Countries adopted the Integrated Coastal Zone Management (ICZM) Protocol of the West Indian Ocean (WIO) during the Conference of Plenipotentiaries from September 11-15, 2023, in Madagascar. The Protocol serves as a framework for regional and national cooperation in managing the coastal zone sustainably in the WIO. The ICZM Protocol is the result of a consultative process and will be followed the Second Negotiating Meeting for the Nairobi Convention Biodiversity Protocol.[73]

Additional initiatives of the Nairobi Convention during the 2022-2023 period included improving the environment-fisheries nexus through regional consultation workshops, the amendment of the Nairobi Convention Protocol concerning protected areas and wild flora and fauna,[74] a "Marine Spatial Planning and Information Management Capacity Building Workshop" to inform the development of a West Indian Ocean Regional Information Management Strategy,[75] and the convening of the Western Indian Ocean Marine Science Association (WIOMSA) Scientific Symposium, the largest scientific conference focused on the marine and coastal environment in the WIO.[76]

The marine environment, coastal waters and related river waters in West, Central and Southern Africa are managed through the Abidjan Convention. The Convention provides a framework for: a) cooperation on marine and coastal environments; and b) sharing of knowledge on environmental hazards, pollution, habitats, biodiversity, sustainable resource use and other activities that may have a negative impact on the health of ecosystems. The coastal waters within the convention area contain highly productive ecosystems that support rich fisheries, coastal tourism, industries, numerous busy ports and provide an important livelihood for many coastal communities.[77]

Active projects under the Abidjan Convention include the West Africa Coastal Areas Management Program (WACA) in partnership with the World Bank and the

70 UNEP. Africa. https://www.unep.org/regions/africa
71 Africa Climate Summit. 2023. https://africaclimatesummit.org/
72 Nairobi Convention. About the Nairobi Convention. https://www.nairobiconvention.org/
73 Nairobi Convention. 2023. Conference of Plenipotentiaries Meeting for the Adoption of the Integrated Coastal Zone Management Protocol for the Western Indian Ocean. https://www.nairobiconvention.org/plenipotentiaries-iczm-adoption-2023/
74 Nairobi Convention. 2023. Marine Conservation in the Western Indian Ocean Region Takes a Step Forward. https://www.nairobiconvention.org/first-east-africa-wild-flora-and-fauna-protocol-negotiations/
75 Nairobi Convention. 2022. Strengthening the Western Indian Ocean (WIO) Blue Economy. https://www.nairobiconvention.org/strengthening-wio-blue-economy-through-msp-and-ims/
76 Nairobi Convention. 2022. Nairobi Convention at the 12th WIOMSA Symposium. https://www.nairobiconvention.org/nairobi-convention-at-the-12th-wiomsa-symposium/
77 UNEP. West and Central Africa. https://www.unep.org/explore-topics/oceans-seas/what-we-do/working-regional-seas/regional-seas-programmes/west-and?_ga=2.75356242.1512179061.1697474542-1063231059.1695377423

Mami Wata Project "Enhancing Marine Management in West, Central and Southern Africa through Training and Application" implemented by the GRID-Arendal and the Abidjan Convention Secretariat.[78] These initiatives support countries' efforts to improve the management of their shared coastal resources and reduce the natural and man-made risks affecting coastal communities through transfer of knowledge, political dialogue among countries, and mobilization of public and private finance to tackle regional issues at the ocean-climate nexus. Marine spatial planning, integrated fisheries management, and responsible scaling up of the blue economy remain priorities for the region.[79]

Regional developments in the East Asia Sea

The East Asia region is home to more than 2.1 billion people. With growing economies and populations that are highly dependent on the ocean sector and coastal and marine ecosystems, countries in the region are facing increasing pressure and challenges in their development processes. These challenges stem from destruction and loss of habitats and natural coastlines, biodiversity loss and degradation, overfishing and food security, pollution from land-based and sea-based sources, and impairment of water quality, water supply and water security, amongst others. At the same time, the region is recognized to be one of the most vulnerable to the hazards and adverse impacts of climate change, extreme weather events and other natural and man-made hazards.

Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) is a regional coordinating mechanism created by 11 country partners (Cambodia, China, DPR Korea, Indonesia, Japan, Lao PDR, The Philippines, Ro Korea, Singapore, Timor Leste and Viet Nam) and non-state partners with the mission to foster healthy and resilient coasts, ocean, peoples and economies in the East Asian Seas region. PEMSEA collectively developed and implemented a regional strategy called 'Sustainable Development Strategy for the Seas of East Asia (SDS-SEA).[80] The SDS-SEA is updated and refined every five years.

The latest SDS-SEA Implementation Plan for 2023-2027 set targets by taking stock of the accomplishments and lessons from the previous planning cycle. Additional guidance stems from the post-2020 initiatives and actions to accelerate sustainable solutions in line with the SDGs at global, regional and national levels, the COVID-19 post-pandemic recovery measures, and more importantly, the direction provided in the Preah Sihanouk Ministerial Declaration for stepping up actions on the road to 2030.[81]

For PEMSEA country partners, climate change adaptation/disaster-risk reduction (CCA/DRR) is a key area of concern due to the major impacts of ocean warming, sea-level rise, and ocean acidification, which is already increasing significantly through the years. All PEMSEA country partners identify climate change adaptation and disaster-risk reduction management (CCA/DRRM) as priorities towards the achievement of sustainable development, particularly in terms of enhancing adaptive capacity, risk assessment, and improving response systems and infrastructure. The PEMSEA country partners have accordingly subscribed to many global and regional agreements towards this end. The SDS-SEA's objective on CCA/DRR is to strengthen capacities in managing the risks associated with climate change and other natural and anthropogenic hazards across the region.

Other significant regional documents include the

78 Ibid.

79 Learn more at: https://www.wacaprogram.org/, https://mamiwataproject.org/

80 PEMSEA (Partnerships in Environmental Management for the Seas of East Asia). 2015. Sustainable Development Strategy for the Seas of East Asia (SDS-SEA). PEMSEA, Quezon City, Philippines. Updated 2015. http://pemsea.org/sites/default/files/SDS-SEA%202015%20FINAL%2002222016%20FULL.pdf

81 PEMSEA. 2022. Sustainable Development Strategy for the Seas of East Asia Implementation Plan 2023-2027. https://www.pemsea.org/publications/books/sustainable-development-strategy-seas-east-asia-implementation-plan-2023-2027

Association of Southeast Asian Nations (ASEAN) State of Climate Change Report (ASCCR) which provides an overall outlook of the state of play of climate change issues in the ASEAN region.[82] ASCCR is a forward-looking report, which includes recommendations on making the transition toward 2030 and on to 2050 for both adaptation and mitigation, considering ASEAN's development context and the long-term goals of the Paris Agreement. The challenges confronting the ASEAN region, as well as the current commitment of ASEAN to contribute to the UNFCCC and the Paris Agreement (PA), are also discussed.

Recognizing the dual challenges to meet reporting requirements under the Enhanced Transparency Framework (ETF) and to make progress towards the ambition of the PA goals of limiting global average temperature increase to well below 2°C and preferably to 1.5°C compared to pre-industrial levels, the report develops a methodology to assess the current progress of actions and the need to strengthen them through 2030 and on to 2050 based on the concepts of "transparency" and "transformation". With the first GST in 2023 to assess the collective progress towards achieving the purpose of the Paris Agreement, the ASCCR and the SDS-SEA 2023-2027 will act as crucial guides prior to such a critical juncture.

In June 8, 2022, to commemorate the World Ocean Day and in support of the Glasgow Climate Pact's agreement to convene an annual global dialogue on ocean and climate, PEMSEA organized an 'Ocean and Climate Dialogue: East Asian Seas' Response to Global Climate Change Challenge'.[83] The objectives of the regional dialogue were to increase understanding of the links between the ocean and climate change and share the region's progress in using ocean-based adaptation solutions as part of national development plans and policies. The dialogue revealed that there is a growing understanding of how climate change impacts the oceans.

The impacts of climate change on fisheries, and the best adaptation solutions in the coastal and marine sector, were shared at the dialogue, where it was emphasized that such adaptation is critical for the EAS region. Other ideas shared included the need for adaptation driven NDCs, increasing coastal resilience through blue carbon, development and application of monitoring and measuring tools on blue carbon development, and developing greater scientific knowledge on regional climate change impacts on the coasts and ocean in the region.

At the national level, PEMSEA country partners reported on their various initiatives to adapt and mitigate climate change, including China's blue carbon restoration efforts and Japan's Green Growth Strategy. Cambodia, Indonesia, the Philippines, and Viet Nam have incorporated coastal and marine sector actions and targets into their NDCs. The Republic of Korea is exploring ocean-based solutions to climate change, while Singapore presented its ongoing research on the ocean–climate interface.

For local governments that are implementing integrated coastal management (ICM) programs in the region, CCA/DRRM plans are developed, adopted and implemented and mainstreamed in most cases into their comprehensive development and investment plans, as well as spatial plans.

In 2022, the PEMSEA Network of Local Government at its annual General Assembly committed to strengthen coastal resilience through sustainable and inclusive integrated coastal management through the signing of the Tangerang Initiative.[84] Highlights of the initiative include a commitment to share the knowledge and experience as advocates of ICM particularly in developing, demonstrating, maintaining, and continually improving the application of ICM across the region.

Moreover, as part of its efforts to reduce greenhouse gas emissions in the maritime transport industry, PEMSEA has developed the Port Safety, Health, and Environmental Management (PSHEM) Code and System to provide port authorities and operators with a tool to assess and improve their operational procedures and performance consistent with relevant international and national regulations, guidelines, and standards. This has been adopted so far in two international ports in Thailand and four in the Philippines. The implementation of this tool in these ports has generated environmental and economic benefits in terms of compliance to regulatory requirements, reduction in CO_2 emission, and increase in green cover inside the port premises.

Regional developments in the Caribbean

The United Nations Environment Programme Caribbean Environment Programme and Cartagena Convention Secretariat located in Kingston, Jamaica serves the governments of the Wider Caribbean. To date, there are 26 Contracting Parties to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention). The Convention is supported by three technical agreements or Protocols on Oil Spills, Specially Protected Areas and

82 ASEAN. State of Climate Change Report (ASCCR). 2021. https://asean.org/wp-content/uploads/2021/10/ASCCR-e-publication-Correction_8-June.pdf

83 PEMSEA. 2022. Ocean and Climate Dialogue: East Asian Seas' Response to the Global Climate Change Challenge. https://pemsea.org/sites/default/files/2022%20Ocean%20RTD_Program_ao%206jun2022.pdf

84 PEMSEA. 2022. Tangerang Initiative on Strengthening Coastal Resilience Through Inclusive and Sustainable Integrated Coastal Management. http://www.pemsea.org/publications/agreements-and-declarations/tangerang-initiative-strengthening-coastal-resilience

Wildlife (SPAW) and Land-Based Sources of Marine Pollution (LBS).[85]

The Cartagena Convention Secretariat actively engages with other regional and international bodies, organizations, and mechanisms to protect the marine environment in the Wider Caribbean Region. It promotes greater cooperation amongst countries to address existing threats to the sustainable use of the region's coastal and marine resources, as well as the sustainability of associated coastal and marine ecosystems.

The Cartagena Convention Secretariat provides capacity-building to governments in the Wider Caribbean Region to address their development needs. Ongoing projects under the Secretariat focus on strengthening national and regional capacity to perform environmental quality monitoring and building environmental stewardship and climate-resilient livelihoods. Examples of such work can be seen in the Cartagena Convention Secretariat's 2021-2022 work plan, which encourages sustained partnerships with other Regional Seas Programmes, government institutions, non-governmental organizations, the academic, scientific and research communities, civil society and the private sector. These entities collaborate to develop and implement regional initiatives that promote the sustainable conservation and management of the Caribbean Seas' coastal and marine resources. The 2021-2030 Regional Strategy for the Caribbean Environment Programme (CEP) also serves as a basis for the further development and implementation of approaches that focus on ocean-based economies and support improved regional ocean governance, enhanced partnerships, and action.[86]

Regional developments in the European Union

The European Union (EU) has undertaken a series of policy and legal measures to protect nature and reverse the degradation of ecosystems. The EU has developed a solid legal framework that protects marine and coastal ecosystems. In particular, the EU is committed, through the Marine Strategy Framework Directive, to maintain "healthy, productive and resilient" marine ecosystems, while ensuring more sustainable use of marine resources. The main goal of this EU Directive is to achieve Good Environmental Status (GES) of EU Member States' marine waters. It encourages sustainable use of various marine resources, ensuring their continuity for future generations.

To step up its efforts to achieve this objective, in June 2023, threshold values were endorsed on the maximum extent of adverse impacts on coastal and offshore seabed habitats and on the maximum extent of seabed loss. The collective pressure of human activities needs to be kept within levels compatible with the achievement of good environmental status. The threshold values for the seabed will steer towards greater protection of coastal ecosystems and seabed habitats including sedimentary habitat types - which play a key role in carbon capture.

Another tool from the policy/regulatory point of view which can boost greater confidence and certainty for investors is Maritime Spatial Planning. This is provided for in the very first target of the GBF. The EU's Maritime Spatial Planning Directive complements the Marine Strategy Framework Directive. This ecosystem-based approach to the management of human activities at sea creates certainty for operators who know that their activities, planned in the context of the Maritime Spatial Planning Directive, will be sustainable as long as they comply with the threshold values for good environmental status set by

85 UNEP. Cartagena Convention. https://www.unep.org/cep/who-we-are/cartagena-convention

86 UNEP. 2021. Caribbean Environment Programme: Draft Regional Strategy for the Protection and Development of the Wider Caribbean Region 2020-2030. https://gefcrew.org/carrcu/19IGM/LBSCOP5/Info-Docs/WG.41.INF.22Rev.1-en.pdf

the Marine Strategy Framework Directive.

The EU has augmented this framework with its Biodiversity Strategy for 2030, which commits to legally and effectively protect 30% of EU Member States' waters and to strictly protect one third of this area. Strictly protected areas allow natural processes to function undisturbed from human pressures and threats to the area's overall ecological structure and functioning.[87] The Commission has also adopted a proposal for a Nature Restoration Law with legally binding targets to restore marine ecosystems, and ensure that, by 2030, restoration measures are in place for at least 20% of the EU's land and sea areas in the EU and, by 2050, for all ecosystems in need of restoration. The Nature Restoration Law is one of the key deliverables of the European Green Deal and it is essential to fulfil the EU's commitments in the GBF.

At the international level, the EU fully committed to achieve the Food and Agriculture Organization of the UN (FAO) Code of Conduct for Responsible Fisheries, support the international efforts to improve effective fisheries management and fight Illegal Unreported and Unregulated (IUU) fishing, and promote sustainable aquaculture. In this respect, the EU actively took part in the development of the FAO Voluntary Guidelines on Sustainable Aquaculture recently approved.[88] The EU also supports developing countries in this endeavour and is a member of the UN Forum on Sustainability Standard Aquatic/Blue Food Coalition.

At the domestic level, the EU, based on its Green Deal agenda and its Farm to Fork Strategy, has translated these lines of action into its Common Fisheries Policy (CFP) and its aquaculture policy. The European Commission has recently presented measures to improve the sustainability and resilience of the EU fisheries and aquaculture sector. The Commission has proposed to decarbonise the EU fisheries and aquaculture sector by 2050 as well as reducing the adverse impact of fishing activities on marine ecosystems, including on the Member States' seabed, on sensitive species and on juvenile fish.

The Commission has also adopted Strategic Guidelines for a more sustainable and competitive EU aquaculture for the period 2021-2030 while improving its environmental and climate performance.

One of the core principles of the CFP is to ensure that decision-making is based on best available scientific advice; this requires harmonized, reliable and accurate data sets. The CFP has limited fishing to sustainable levels by maintaining or restoring stocks to levels that can produce the maximum sustainable yield (MSY), which is the maximum number of fish that can be fished while allowing the fish stocks to reproduce and stay at healthy levels in the long-term. Where MSY principles have been implemented, stocks have increased; catches and incomes are improving; and impacts on the marine environment have decreased. These are real, tangible achievements which have been set out in the Annual Communications on the common fisheries policy.

The European Commission launched two studies in 2021-2022. One study addressed the resilience of the CFP and EU fisheries to climate change impacts, while the other assessed the resilience of the EU postharvest value chain to climate change. The Commission aims to increase the use of ecosystem approaches to fisheries management, which will help include these environmental and climatic factors into scientific assessments. This may also allow early detection of climate-induced changes and shocks or shifts in stock productivity that can affect the resilience of fish stocks. This will allow for a better adaptation of management measures in line with the state of the stocks and marine ecosystems.

In February 2022, the European Commission adopted an Ocean and Fisheries Package including an initiative to decarbonise the EU fisheries and aquaculture sector by 2050. This initiative included four sets of actions:

- Stakeholders' cooperation by creating a new Energy Transition Partnership of EU fisheries and aquaculture. This Partnership was launched on June 16, 2022, in Brussels. The objective was to facilitate discussion between stakeholders, and support the sharing of knowledge and best practices, such as on technologies, finance, common research priorities. The Partnership will make concrete, practical and sustainable proposals on solutions for the energy transition.
- Closing the knowledge gaps and innovation gaps;
- Strengthening the skills of the workforce; and
- Improving the business environment and access to finance opportunities.

1.8 Future Directions: How to strengthen synergies between the Climate and Biodiversity Conventions?

The UNFCCC and the CBD were both adopted at the Rio Earth Summit in 1992. The two Conventions were created to be compatible from the outset and this strong potential for synergy has only grown since then. However, despite these promising signs, there is significant

87 European Commission. 2022. Working Document: Criteria and guidance for protected areas designations. https://ec.europa.eu/environment/publications/criteria-and-guidance-protected-areas-designations-staff-working-document_en.

88 Approval of FAO Guidelines for Sustainable Aquaculture by the 12th FAO Sub-Committee on Aquaculture. 2023. Next step: adoption at the next session of the FAO Committee on Fisheries (COFI) in 2024

room for improvement in cooperation mechanisms. The need and opportunities for linked global action on both biodiversity and climate change should be explored through the lens of science, policy, action, and finance.

The Kunming-Montreal Global Biodiversity Framework aims to promote "…coherence, complementarity and cooperation between the Convention on Biological Diversity and its Protocols, other biodiversity-related conventions, and other relevant multilateral agreements and international institutions, respecting their mandates, and creates opportunities for cooperation and partnerships among diverse actors to enhance implementation of the Framework." (Section B, para6).[89] In decision 15/13, the CBD COP invited the governing bodies of relevant multilateral environmental agreements, international organizations and other relevant programmes to formally endorse the Kunming-Montreal Framework. This endorsement should come through individual governance processes and contribute to the implementation and monitoring of the Framework.

Governing bodies of the relevant multilateral environmental agreements should endeavour to further strengthen cooperation at the global level within their respective mandates and enhance synergies among themselves. This will encourage mutually supportive decisions and allow Parties to coordinate their own strategies with the Framework and propose key issues for thematic discussions. This outlines the importance of not only enhancing synergies between the CBD and UNFCCC processes with respect to climate-related issues, but also in building improved cooperation and coordination among diverse stakeholders at the regional, national and local levels to facilitate the scope and scale of action needed. Means to improve synergies across the UNFCCC and COP processes include: a) joint assessments and technical work; b) improved coordination across the IPCC and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES); c) improved coordination across the Conferences of the Parties of the two Conventions and their respective Subsidiary Bodies; d) enhanced coordination among the national-level focal points of these Conventions; and e) coordinated approaches to developing, implementing and reporting on National Biodiversity Strategies and Action Plans (under the CBD) and NDCs and NAPs (under the UNFCCC).

Parties to the UNFCCC have recognized the importance of protecting the ocean and its ecosystems in the Convention and Paris Agreement. In the United Nations Framework Convention on Climate Change, Parties agreed to protect the climate system (Article 2), defined as the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions (Article 1.3). In the Paris Agreement, Parties noted the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as Mother Earth.

The National Adaptation Plan Process facilitates adaptation planning in least-developed countries and other developing countries. Ocean-related supplementary information to the technical guidelines includes recommendations by the CBD.[90] In the context of the Nairobi work program,[91] the UNFCCC knowledge-to-action hub on adaptation and resilience, biodiversity in forests and grasslands, and oceans, coastal areas and ecosystems are mandated thematic areas.[92] In 2022, the NWP expert group on biodiversity published a technical brief on promoting synergies between climate change adaptation and biodiversity.[93] The brief is aimed at national focal points of the Convention on Biological Diversity and the UNFCCC, and intended for use by the governmental agencies engaged in the planning and implementation of NAPs and national biodiversity strategies and action plans.

The Ocean and Climate Change Dialogue 2022 highlighted the vital importance of the ocean to livelihoods and biodiversity, as well as being a fundamental component of the climate system. The Dialogue also highlighted the need, options and opportunities for greater climate action relating to oceans.

Optimizing institutional connections across international policy processes and support and across UN and other international agendas, including with Kunming-Montreal Global Biodiversity Framework, was identified as a cross-cutting issue. This was determined by informal consultations conducted by the 2023-24 ocean dialogue co-facilitators with Parties and non-Party stakeholders. On topic 1 on coastal ecosystem restoration including blue carbon, the ocean dialogue recognized the inherent value coastal ecosystems provide to people and the environment, including for biodiversity.

During the Ocean Dialogue 2023, high-level speakers, including the UNFCCC Executive Secretary, Mr. Simon

89 UNEP Convention on Biological Diversity. 2022. Kunming-Montreal Global Biodiversity Framework. CBD/COP/DEC/15/4

90 See https://www4.unfccc.int/sites/NAPC/Guidelines/Pages/Supplements.aspx

91 UNFCCC. The Nairobi Work Programme: UNFCCC knowledge-to-action hub on adaptation and resilience. https://unfccc.int/topics/adaptation-and-resilience/workstreams/the-nairobi-work-programme-unfccc-knowledge-to-action-hub-on-adaptation-and-resilience

92 UNFCCC SBSTA. 2018. Report of the Subsidiary Body for Scientific and Technological Advice on the first part of its forty-eighth session, held in Bonn from 30 April to 10 May 2018. FCCC/SBSTA/2018/4 (Para 21)

93 Terton, A, Qi, J, and Zúñiga, G. 2022. Promoting Synergies between Climate Change Adaptation and Biodiversity through the National Adaptation Plan (NAP) and National Biodiversity Strategies and Action Plan (NBSAP) Processes. UNFCCC, CBD, IISD, GIZ, UNEP and SwedBio. https://unfccc.int/documents/619807.

Stiell, underscored the importance of the ocean to livelihoods and biodiversity. Participants shared best practices that provide concrete practical solutions and recommendations to Parties for developing national climate action and goals at the climate/ocean/biodiversity nexus. On Topic 1, Parties were encouraged to better streamline national focus areas with other international conventions and agreements, such as the Kunming-Montreal Global Biodiversity Framework. In key messages for COP28, Parties and non-State Parties emphasized strengthening institutional linkages by building synergies for coastal and marine NbS, biodiversity and blue carbon ecosystem-based management across international policy processes. These efforts can enhance global ambition and action for a climate-resilient ocean.

1.9 Summary of achievements and future needs

Amidst growing international recognition of the ocean as a fundamental part of the climate system, the incorporation of ocean issues into the UNFCCC processes remains a priority. This introductory section celebrates key achievements in the ocean-climate nexus since 2021, while highlighting areas where continued progress is needed to ensure the integration of ocean and climate actions at the regional, national, and global levels.

The restoration and protection of ocean health is becoming an integral part of national and global strategies to respond to climate change and its impacts; however, there is much work to be done to raise public awareness about the importance of the ocean for climate, for biodiversity, and as a life support system for the planet Earth. While over 70% of new or revised National Adaptation Plans place the ocean and coastal zones as a fundamental component of climate resilience strategies, current progress in integrating the ocean into national policies and strategies falls short of fulfilling the COP mandates to blue the Paris Agreement. To address this, the GST is promoting the establishment of guidelines for Parties to be able to include and strengthen ocean-based measures in their updated NDCs, NAPs and other national strategies. Stronger linkages to the Global Biodiversity agenda are also being actively pursued.

This process for enhancing collaboration, understanding and building ocean-based climate action is supported through increasingly frequent and impactful high-level dialogues and collaborations at the global, regional and national levels. The UN Climate Change High-level Champions and the UNFCCC Friends of the Ocean and Climate, the annual Ocean and Climate Change Dialogue under the UNFCCC, the UNGA Regular Process for Global Reporting and Assessment of the State of the Marine Environment including Socioeconomic Aspects, the Marrakech Partnership for Global Climate Action, the UN Ocean global and regional conferences, and actions under the UN Decade of Ocean Science, are all serving to advance synergies in the integrated ocean-climate agenda.

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2. NEW SCIENTIFIC FINDINGS ON THE OCEAN AND CLIMATE, UNDERSCORING THE NEED FOR URGENT ACTION AND APPROPRIATE POLICIES

This section reviews recent reports relevant to the ocean-climate interface, as well as latest findings from peer-reviewed research.

2.1 Recent reports and research

The Global Stocktake (GST) is a Party-driven process conducted in a transparent manner and with the participation of non-Party stakeholders (NPS), that enables countries and other stakeholders to see where they are collectively making progress toward meeting the goals of the Paris Agreement – and where they are not. The GST synthesis report, published as a technical paper in September 2023, concludes that much more action is needed to meet the long-term goals of the Paris Agreement – at all fronts and by all actors.[94] It states: 'Global emissions are not in line with modelled global mitigation pathways consistent with the temperature goal of the Paris Agreement, and there is a rapidly narrowing time window to raise ambition and implement existing commitments in order to limit warming to 1.5°C above pre-industrial levels'.[95]

The GST, which started at COP26, will take place every five years. The first-ever stocktake is scheduled to conclude at the UN Climate Change Conference (COP28) in 2023. The GST invites NPS participation and encourages High-Level Champions' support for the active participation of NPS. The Mitigation Work Programme (MWP), established at COP 27, also invites NPS engagement and encourages High-Level Champions' support.

While the GST synthesis report clearly and repeatedly stresses the urgency of addressing the global warming issue, it stays rather vague on the role which the ocean can and should play in that process. In its chapter on mitigation, the report lists protecting natural ocean-based carbon sinks as one of many measures required for reaching net zero emissions, but without specifying how this protection should be granted. A few more details are provided in the section on adaptation planning, where the report lists adaptation actions and examples of good practices responding to ocean climate hazards such as sea-level rise and changes in ocean circulation, temperature and chemistry.

However, further explanations and insights on the ocean's role in climate-resilient development are missing due to the overarching nature of the GST synthesis report's key findings. They focus on the bigger socio-economic transformations required for reaching net zero emissions by or around mid-century. While these findings are essential for accelerating collective progress, they lack the layers of information expected by ocean and nature advocates. This may include highlighting the integrated roles of atmosphere, land, coast and ocean, which jointly influence sustainability. This is particularly important information as many tend to silo their approaches to these spaces, which ultimately limits overall effectiveness of sustainable action.

Within this framework, additional in-depth analysis of the nations' long-term adaptation and mitigation strategies will be needed to a) identify which ocean-based adaptation measures are planned and implemented; b) confirm the extent those measures will be affected by the oceans' mitigation capacity and the adaptation limits of marine ecosystems; and c) identify how many governments count on the ocean to absorb additional carbon dioxide or envision to use carbon capture and storage (CCS) for storing significant amounts of that greenhouse gas deep below the ocean floor.

2.2 Recent peer-reviewed research

A short review and summary of findings from peer-reviewed research is presented in this section. It includes the topics of ocean warming, sea-level rise, ocean acidification, de-oxygenation, multiple stressors including climate change, socio-economic and cultural impacts of climate change including impacts on fisheries and aquaculture; and building resilience.

The most recent UN Intergovernmental Panel on Climate Change AR6 Report states that ocean warming, acidification and deoxygenation will continue to increase during the 21st century at rates dependent on future emissions of carbon dioxide and greenhouse gases.[96] The Intergovernmental Panel on Climate Change (IPCC) AR6 states with high confidence that ocean warming and ocean acidification have already affected food production including shellfish aquaculture and fisheries in some regions.[97] The IPCC consistently reports impacts and risks to ocean ecosystems from climate change under various warming scenarios.

In unprecedented terms, "Climate Change 2022: Impacts, Adaptation and Vulnerability the Working Group II Contribution to the IPCC Sixth Assessment Report"

94 Technical dialogue of the first global stocktake. Synthesis report by the co-facilitators on the technical dialogue. UNFCCC/SB/2023/9

95 Ibid.

96 IPCC. 2023. Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp., doi: 10.59327/IPCC/AR6-9789291691647.

97 Ibid.

emphasizes climate impacts, adaptation and vulnerability to ecosystem and human communities.[98] The recent report indicates present and near-term risk and vulnerabilities, and further clarifies the need to promote and strengthen adaptation measures. Specifically, the report indicates that climate change has caused substantial damages—and increasingly irreversible losses—in terrestrial, freshwater, and coastal and open marine ecosystems. The extent and magnitude of climate change impacts are larger than estimated in previous assessments. These impacts include species loss in the ocean driven by increases in extreme heat events, and the loss and degradation of coral reefs, low-lying coastal wetlands, and kelp-forests.[99]

The surficial 2,000 meters of the global ocean has been warming since the 1950s. The rate of warming increased from the 1960s, and in 2021, the hottest ever global ocean temperature was recorded.[100] Warming is projected to increase from two- to six-fold through the Year 2100 depending on emissions scenarios.[101] For sea-surface temperature (SST), 2023 saw record global ocean SSTs along with numerous marine heatwave (MHW) events.[102] The proportion of time the global ocean is subject to MHW conditions has increased by more than 50% from 1925 to 2016 – and the frequency of MHWs is predicted to continue to increase up to Year 2100.[103]

Impacts such as increased de-oxygenation are linked to global warming, with about 2% of the oxygen content in the ocean lost since the 1960s.[104] There is now a strong research focus on predicting regional impacts. One example is in the Central Indo-Pacific, where an analysis of five regions showed ocean deoxygenation had accelerated in all regions over a multi-decadal period.[105] Also linked to warming is global sea-level rise (SLR) - with global mean sea level increasing by 0.20 [0.15–0.25] m between 1901 and 2018 and predicted to continue to rise for thousands of years depending on emissions scenario.[106]

Ocean deoxygenation, a major consequence of ocean warming, remains a continued concern. New modeling refines understanding of naturally occurring oxygen minimum zones (OMZs). This suggests that the Pacific OMZ will grow in response to climate change due to weaker ventilation by ocean circulation. However, the core of the Pacific OMZ where oxygen is lowest will shrink.[107] A synthesis of recent advances in forecasting impacts of oxygen loss on marine biogeography, biodiversity, and biogeochemistry reflects growing attention to the relationship between oxygen supply and demand driven by temperature and its variability.[108] This relationship yields consequences for habitat loss in marine species[109] and for fisheries disruption.[110]

For example, assessments of 47 representative marine species covering the epipelagic, mesopelagic, and demersal realms suggests that most species will lose less than five percent of their current habitat volume at 2°C of global warming. However, the impacts vary widely among different habitats and species, with species vulnerability as the most important indicator of deoxygenation impacts. Greater losses are projected for blue whiting, blackfin tuna, Atlantic redfish, American plaice, and northern wolfish.[111] The threat of ocean deoxygenation to shallow coral reefs gained greater recognition. Data-based analysis of 32 reefs suggest that 84% currently experience weak to moderate hypoxia and 13% experienced severe (≤61 µmol O2 kg^{-1}) hypoxia with projected climate change slated to increase the duration, intensity and severity of hypoxia.[112]

Ocean warming and ocean acidification (OA) have adversely affected food production, including shellfish aquaculture and fisheries in some regions. Additional risks to food security and safety caused by climate change include compounding health effects of seafood contamination from increased harmful algal blooms.[113] A decrease in seafood production and availability is especially impactful for coastal communities with limited

98 Ibid.

99 Ibid.

100 Cheng, L., Abraham, J., Trenberth, K.E. et al. 2022. Another Record: Ocean Warming Continues through 2021 despite La Niña Conditions. Adv. Atmos. Sci. 39, 373–385. https://doi.org/10.1007/s00376-022-1461-3

101 Cheng, L., von Schuckmann, K., Abraham, J.P. et al. 2022. Past and future ocean warming. Nat Rev Earth Environ 3, 776–794 https://doi.org/10.1038/s43017-022-00345-1

102 Copernicus. 2023. Global sea surface temperature reaches a record high. https://climate.copernicus.eu/global-sea-surface-temperature-reaches-record-high#:~:text=Credit%3A%20Copernicus%20Climate%20Change%20Service%2FECMWF,-DOWNLOAD%20VIDEO%20%7C%20DOWNLOAD&text=For%20the%20North%20Atlantic%20as,C%2C%20set%20in%20September%202022

103 Smith, K. E., Burrows, M. T, Hobday, A. J., King, N.G, Moore, P.J., Gupta, A.S., Thomsen, M.S., Wernberg, T. and Smale, D. A. 2023. "Biological impacts of marine heatwaves." Annual Review of Marine Science 15. 119-145.

104 Schmidtko, S., Stramma, L., Visbeck, M. 2017. Decline in global oceanic oxygen content during the past five decades. Nature 542, 335, doi: 101038/nature21399

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diet diversity who disproportionately rely on marine resources for primary protein.

That said, food security alone does not account for the full suite of socio-economic and socio-cultural vulnerabilities posed by climate change impacts to marine resources including economies, livelihoods, social and cultural practices and traditions. While vulnerability of ecosystems, species and human communities to climate change differs substantially across and within regions, the report finds that adaptation progress is unevenly distributed with prominent adaptation gaps.[114]

It is also understood that climate change will have disproportionate impacts on some frontline and indigenous communities, whether due to geographic location or specific reliance on (or connection to) ecosystems and species that are most susceptible to impacts of climate-ocean change. Furthermore, limited availability of local data, information and evaluation of response strategies pose challenges to robust adaptation planning and current financial flows for adaptation are insufficient. This means that express guidance on enabling conditions for ocean and coastal adaptation are needed across the UNFCCC and should reflect adaptation themes outlined in the IPCC 2022 report: political commitment and follow-through, institutional frameworks, policies and instruments with clear goals and priorities, enhanced knowledge on impacts and solutions, mobilization of and access to adequate financial resources, monitoring and inclusive processes.

While increasing ambition to meet Convention goals and targets (and specifically, drastically reducing CO_2 emissions) is paramount for mitigating OA, there are actions that Parties can and should be taking now that will allow for increased adaptation and resilience of vulnerable ecosystems and species. These steps can further bolster the ability of human communities to cope with future change. Enhancing regional knowledge of ocean and coastal risks and impacts caused by climate change— alongside understanding and engaging with coastal community priorities—will help inform the most meaningful adaptation options.

The interconnection of biodiversity and climate change has received growing attention at high levels, but actions on these two fronts are rarely linked to each other.[115] This approach needs to be streamlined, as conservation actions that halt, slow or reverse biodiversity loss can simultaneously slow anthropogenic-mediated climate change.[116] There are opportunities for the deep sea to contribute to international goals, including the SDGs, the Paris Agreement and the post-2020 Biodiversity Goals. More holistic, nature-based views of the deep sea that include the many ecosystem services and biodiversity roles in the carbon cycle can facilitate these connections.[117] Many proposed ocean-based climate mitigation technologies, which adopt the deep sea as an ultimate repository for removed carbon, threaten to exacerbate oxygen loss, acidification and biodiversity loss.[118]

Climate is now recognized to influence fisheries and food security in the high seas and deep sea. Assessment of the risks of climate impacts to the population viability of 32 species of exploited demersal deep-sea species across the global ocean indicates that most exploited deep-sea fishes are likely to be at higher risk of local, or even global, extinction. This differs from previous assessments because of their high vulnerability to both climate change and fishing.[119] Climate-induced redistribution of species such as tuna creates potential for conflict between fisheries and new industries such as deep seabed mining with resultant environmental and economic repercussions.[120]

Along the East Coast of the United States, valuable species such as lobster and summer flounder are moving north, leading to legal and territorial disputes between northern and southern fishers.[121] Warming waters also contributed to an increase in Atlantic cod natural mortality and a decrease in its productivity.[122] These findings are echoed in research on climate variability. More prevalent positive phases of the North Atlantic Oscillation, which is linked to warmer-than-average winters, have decreased the productivity of Atlantic cod, leading to a 17% decline in biomass from 1980-2013.[123] Similar

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trends were found in bivalves such as oysters, quahogs, soft-shell clams and bay scallops, along with declines in fishing effort.[124] Declines in New England catch across all species due to climate variability led to a loss of 16% in fishing employment from 1996-2017.[125]

Similar impacts have been measured along the Pacific Coast of the United States.[126] In Alaska, declines in salmon size and egg production have led to decreased prices for fishers (because smaller fish are worth less) and less food for rural subsistence communities.[127] A growing literature shows how MHW can lead to harmful algal blooms with large ecological and economic impacts.[128] The 2014-2016 northeast Pacific MHW led to declines in catch of Dungeness crab, with smaller vessels taking the brunt of the impacts and vessels with diverse catch doing better.[129]

New work points to assessment of blue carbon stocks, changes to these stocks, and their mitigation potential as a growing element in designing meaningful protection of the global ocean and polar regions.[130] For application in deep water, new platforms and technologies are being developed. Blue carbon concepts are also being incorporated into fisheries management and ways to optimize food security, climate action and marine conservation.[131] Design of climate-smart marine protected areas (MPA) in the high seas now considers planning in 3 dimensions (including vertically), incorporating projected changes, biodiversity conservation and avoidance of fishing conflicts.[132] Although the planetary boundary initiatives to safeguard humanity have been slow to incorporate the ocean, new work acknowledges the need to conserve natural ecosystems in the ocean to maintain carbon sequestration and minimize marine species extinction.[133]

Closer attention to the interaction of anthropogenic nitrogen inputs to coastal systems with physical transport processes like eddies[134] and with global warming[135] is improving predictions of deoxygenation and acidification under future climate scenarios. Recent research has improved understanding of deoxygenation and multi-stressor consequences for invertebrate and fish larval development, vision, feeding ability, habitat suitability and distribution.[136]

Changing climate and negative impacts on the ocean and rights of people have recently been detailed in a special issue edition of *International Journal of Marine and Coastal Law*. Climate is infringing on the rights to a healthy environment, food, and culture.[137] One Ocean Hub research reveals the devastating impacts of climate change on Indigenous Peoples, small-scale fishers, women, and children. Indigenous and traditional knowledge and their knowledge holders are often marginalised from international and national dialogues shaping the future of our ocean and climate. The Hub has evidenced however, that vulnerable communities (including Indigenous Peoples and traditional knowledge holders) do not perceive themselves as vulnerable and have taken steps to adapt to climate change, underpinned by their knowledge and views. Understanding and including other knowledges are crucial in shaping fair, inclusive, and effective ocean and climate action.[138]

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An interdisciplinary team of researchers recommend 13 principles that strategically and critically support a more inclusive and equitable approach to transform ocean governance.[139] These principles stem from ecological, social and legal disciplines to respond to calls to reform current ocean-use practices that have perpetuated inequities and fuelled conflict and environmental decline.

In the context of fisheries, climate change has affected the biogeographical distribution of fish species towards the high latitudes, jeopardizing food security and livelihoods in the tropics and causing forced migration among coastal communities that rely on fisheries resources.[140] As most fishers rely on fishing for food, income and/or employment, a changing ocean can therefore significantly impact fishers' lives. Potential impacts include the inability to exercise of their rights of access to fisheries resources, rights to fish, to food, to work, to culture, and to a healthy, clean and sustainable environment.[141]

A healthy ocean is also essential for children's life and survival. Ocean-based solutions to climate change, through blue carbon habitats such as seagrasses and mangroves, provide an estimated 50 percent of carbon dioxide stored in the ocean.[142] The increase in extreme weather events caused by climate change such as droughts and floods, weakens food and water security, and children's access to essential services, including health services and schooling, impacts children's rights to health and education, and inhibits their rights to the highest attainable development.[143] Furthermore, 90 percent of the global burden of disease associated with environmental crises is carried by children under the age of five disproportionately impacting children's rights to health, life, survival and development, and posing direct risks to future generations.[144] Hub research noted the need to clarify the obligations of States under the Law of the Sea to put children's human rights at the heart of decision-making on the protection of the marine environment, particularly at the ocean-climate nexus.[145]

There is also an ongoing challenge to food security in the light of climate impacts with fisheries being identified as particularly vulnerable and requiring a wide range of adaptive measures.[146] Now that aquaculture has overtaken wild capture fisheries globally, there is also an increased focus on adaptation and resilience in this sector.[147] Over the past 26 years, the requirement to end overfishing and rebuild overfished stocks under the Magnuson-Stevens Act have stabilized fish populations in the United States.[148] These science-based policies are also projected to make fisheries more resilient to climate change.[149] However, some current management holds fish ranges and natural mortality constant, assumptions that may not apply under climate change. Such assumptions can lead to unintentional overfishing.[150]

Individually, fishers can hedge against climate shocks by diversifying their catch, as species respond differently and some may even benefit.[151] However, current regulations make this difficult, e.g. by requiring additional permits, boats and/or gear to fish different species and tying quota allocations to historical catch.[152] There is evidence of industry consolidation, the reasons for which are debated.[153] Small-scale fishers with smaller boats that cannot follow fish north and limited financial resources to buy permits in other fisheries are especially

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vulnerable.[154] Meanwhile, increased demand for seafood has largely been met by importing more fish, both wild-caught and farmed.[155] This raises concern over leakage of overfishing from the U.S. to less regulated countries and increased emissions from shipping.[156] Global fisheries and aquaculture production in 2021 was estimated to be 218.4 million tonnes, with 57.7% coming from aquaculture (including algae).[157] Future climate change is projected to cause global declines in catch and revenue, with increasing conflict and the world's tropical regions bearing the brunt of species loss.[158] Extreme events are projected to amplify these effects.[159]

2.3 Remaining knowledge gaps for action

A strategic process for prioritizing and closing knowledge gaps must occur alongside guidance on enabling conditions for ocean and coastal adaptation measures. Such a process for prioritizing and closing knowledge gaps should:

- Emphasize the importance of regional risk and vulnerability assessments to identify, improve and diversify the knowledge of combined impacts of ocean warming, acidification and deoxygenation;
- Increase and ease access to climate financing for ocean and coastal climate monitoring and research, risk assessments and remediation or adaptation measures; exploring pilot projects, cost-benefit frameworks, and more inclusive criteria for priority investments would be instructive;
- Evaluate feasibility dimensions relative to ocean and coastal adaptation measures, as defined by AR6 Working Group II;[160]
- Consider and evaluate the role of and Nature-Based Solutions across freshwater, coastal and ocean ecosystems to sequester carbon, remediate or ameliorate coastal acidification, improve water quality, limit coastal erosion, provide protection from extreme event, facilitate movement and protection of species (refugia), support adaptive management and promote resilience strategies for highly vulnerable species and reduce land-based/ terrestrial sources of pollution that exacerbate local ocean acidification conditions;
- Incorporate ocean acidification and other ocean-climate change indicators across a range of universally accepted adaptation strategies like disaster-risk management and recovery, cost-benefit frameworks, early warning systems, climate services and risk spreading;
- Draw from and highlight appropriate links to ocean-climate risk, vulnerability and adaptation work happening through the Nairobi Work Programme expert group on oceans; Warsaw International Mechanism for Loss and Damage (WIM); FAO climate change adaptation field projects and programmes for fisheries and aquaculture; Local Communities and Indigenous Peoples Platform (LCIPP);[161]
- Engage relevant partners in expediting multi-stressor research on the adaptation potential of keystone seafood species;
- In partnership with the UN Decade of Ocean Science for Sustainable Development relevant programmes—establish a framework to outline regional priority gaps in data and information related to seafood security, alongside an inventory of technological and institutional capacity needs for measuring coastal impacts of ocean warming, acidification, and deoxygenation;
- Parties should include consideration of climate-ocean risk assessment, mitigation and adaptation measures across NDCs and NAPs, while emphasizing the role of information needs; and
- Adaptation measures should prioritize equity, justice, cooperation, and inclusive decision making with local communities and Indigenous People; this includes recognition of Tribal sovereigns and Treaty rights and inherent rights of Indigenous peoples.

Many questions remain about the carbon cycle and the physical, carbonate and biological pumps that compose this cycle in the open ocean. Observing processes that simultaneously occur on spatial and temporal scales

154 Young, T., Fuller, E. C., Provost, M. M., Coleman, K. E., St. Martin, K., McCay, B. J., and Pinsky, M. L. 2020. Adaptation strategies of coastal fishing communities as species shift poleward. ICES J. Mar. Sci. 76, 1 (Jan. 2019), 93–103.; Jardine, S. L., Fisher, M. C., Moore, S. K., and Samhouri, J. F. 2020. Inequality in the economic impacts from climate shocks in fisheries: The case of harmful algal blooms. Ecol. Econ. 176, 106691.

155 NMFS. Fisheries of the United States, 2019. Current Fishery Statistics No. 2019, U.S. Dept. of Commerce, NOAA, 2021.; Gephart, J. A., Froehlich, H. E., and Branch, T. A. 2019. Opinion: To create sustainable seafood industries, the United States needs a better accounting of imports and exports. Proc. Natl. Acad. Sci. U. S. A. 116, 19, 9142–9146.

156 Smith, M. D., Roheim, C. A., Crowder, L. B., Halpern, B. S., Turnipseed, M., Anderson, J. L., Asche, F., Bourillón, L., Guttormsen, A. G., Khan, A., Liguori, L. A., McNevin, A., O'Connor, M. I., Squires, D., Tyedmers, P., Brownstein, C., Carden, K., Klinger, D. H., Sagarin, R., and Selkoe, K. A. 2010. Sustainability and global seafood. Science 327, 5967, 784–786.; Berkes, F., Hughes, T. P., Steneck, R. S., Wilson, J. A., Bellwood, D. R., Crona, B., Folke, C., Gunderson, L. H., Leslie, H. M., Norberg, J., Nyström, M., Olsson, P., Osterblom, H., Scheffer, M., and Worm, B. 2006. Ecology, globalization, roving bandits, and marine resources. Science 311, 5767, 1557–1558.; Ziegler, F., Winther, U., Hognes, E. S., Emanuelsson, A., Sund, V., and Ellingsen, H. 2013. The carbon footprint of Norwegian seafood products on the global seafood market. J. Ind. Ecol. 17, 1, 103–116.

157 FAO FishStatJ, https://www.fao.org/fishery/en/topic/166235?lang=en

158 Lam, V. W. Y., Cheung, W. W. L., Reygondeau, G., and Sumaila, U. R. 2016. Projected change in global fisheries revenues under climate change. Sci. Rep. 6, 32607

159 Cheung, W. W. L., Frölicher, T. L., Lam, V. W. Y., Oyinlola, M. A., Reygondeau, G., Sumaila, U. R., Tai, T. C., Teh, L. C. L., and Wabnitz, C. C. C. 2021. Marine high temperature extremes amplify the impacts of climate change on fish and fisheries. Sci Adv 7, 40, eabh0895.

160 IPCC. 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee, and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp., doi: 10.59327/IPCC/AR6-9789291691647.

161 UNFCCC SBSTA. 2022. Report of the Subsidiary Body for Scientific and Technological Advice on its fifty-second to fifty-fifth session, held in Glasgow from 31 October to 6 November 2021. https://unfccc.int/sites/default/files/resource/sbsta2021_03_adv_0.pdf

spanning orders of magnitude presents major challenges for research and lead to high uncertainties.[162] Most components are too poorly understood to predict the effects of ocean warming, acidification and deoxygenation on carbon export to the deep ocean. How large-scale carbon dioxide removal actions will affect this is also uncertain.[163] On deoxygenation there are strong uncertainties in how long-term global climate change intensifies metabolic storms (when high temperatures cause elevated organismal oxygen demand simultaneous with a decline in oxygen available in seawater), how differential species oxygen sensitivities alter the structure of ecological communities, and how global oxygen loss intersects with coastal eutrophication.[164] Poor ability to separate anthropogenic trends from natural variations continues to plague projection of oxygen changes.[165] Potential for deep-seabed mining continues to raise concerns about climate consequences. Effects of deep-seabed mining on microbial and prokaryote 'loops' in the carbon cycling process are important gaps in assessing the link between mining and the carbon cycle.[166] Human rights, equity and indigenous voices are emerging concepts in the consideration of ocean, climate and conservation, and many questions remain about how to amplify these voices in areas beyond national jurisdiction.[167]

Although there is growing awareness worldwide about the impacts of climate change on marine ecosystems and communities, more needs to be done to understand the vulnerability and contribution of deep-sea ecosystems to climate change mitigation.[168] Due to the high costs of ocean research, particularly in deep and open ocean ecosystems, there are a limited number of countries that can afford the costs and risks of deep-sea research.[169] States' limited knowledge of deep-sea ecosystems hin-

162 Osborne, Emily Jessica Y. Luo, Ivona Cetinić, Heather Benway, and Susanne Menden-Deuer. 2023. Our Evolving Understanding of Biological Carbon Export. EOS 12 September 2023 UNFCCC SBSTA

163 Levin, Lisa A., Joan M. Alfaro-Lucas, Ana Colaço, Erik E. Cordes, Neil Craik, Roberto Danovaro, Henk-Jan Hoving, Jeroen Ingels, Nélia C. Mestre, Sarah Seabrook, Andrew R. Thurber, Chris Vivian, Moriaki Yasuhara. 2023. Deep-sea impacts of climate interventions. Science 379: 978-981.

164 Deutsch et al. 2023. Climate, Oxygen, and the Future of Marine Biodiversity. Annu. Rev. Mar. Sci. 2024. 16:20.1–20.29. https://doi.org/10.1146/annurev-marine-040323-095231

165 Poupon, M. A., Resplandy, L., Levy, M., & Bopp, L. 2023. Pacific decadal oscillation influences tropical oxygen minimum zone extent and obscures anthropogenic changes. Geophysical Research Letters, 50, e2022GL102123. https://doi.org/10.1029/2022GL102123

166 Stratmann T. 2023. Role of polymetallic nodule dependent fauna on carbon cycling in the eastern Clarion-Clipperton Fracture Zone (Pacific). Front. Mar. Sci. 10:1151442. doi: 10.3389/fmars.2023.1151442.

167 Morgera, E. et al. 2023. Addressing the Ocean-Climate Nexus in the BBNJ Agreement: Strategic Environmental Assessments, Human Rights and Equity in Ocean Science. The International Journal of Marine and Coastal Law 38 (20 23) 1–33. doi:10.1163/15718085-bja10139

168 La Bianca, G. et al. 2023. "A standardised ecosystem services framework for the deep sea." Frontiers in Marine Science 1–16, https://doi.org/10.3389/fmars.2023.1176230

169 Roberts, J. et al. 2023. "A blueprint for integrating scientific approaches and international communities to assess basin-wide ocean ecosystem status." 4 Communications Earth & Environment 12, https://doi.org/10.1038/s43247-022-00645-w


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ders their ability to make sound decisions on areas beyond national jurisdiction, sustainably manage deep marine spaces within national jurisdictions, and protect their ocean-dependent communities' human rights. [170] There is a need for strategic environmental assessments (SEAs) as proactive and future-thinking assessments to better understand ecosystems and their services, as well as possible risks and cumulative impacts.[171] SEAs consider long-term implications of ocean management taking into account cumulative impacts (including from climate change) and broader human rights implications for local coastal communities, including women and children, small-scale fishers, Indigenous and local knowledge holders.[172]

Further, achieving equity among States in the context of ocean knowledge production and environmental management requires action at the institutional level. This includes a comprehensive, sustainable and inclusive approach to ocean-based climate action that would also establish the necessary framework for channeling climate finance to the ocean. Lessons learned from the approach used for reducing emissions from deforestation and forest degradation (REDD+) and the example of the Climate and Clean Air Coalition can provide helpful direction. In addition, relevant guidance under the CBD and international human rights law demonstrates an urgent need to develop a multi-actor coalition across different international treaties and United Nations bodies to 'protect and restore the ocean's contributions to climate regulation, human well-being and planetary health'.[173]

There continues to be a need for adequate monitoring systems that provide data on climate change parameters at appropriate scales.[174] The impacts of climate change are not acting in isolation and understanding cumulative stress from the impact of multiple ocean stressors is still a major knowledge gap.[175] There are also many new emerging pressures such as the impacts of seabed

170 Morgera, E. et al. 2023. "Addressing the Ocean-Climate Nexus in the BBNJ Agreement: Strategic Environmental Assessments, Human Rights and Equity in Ocean Science." The International Journal of Marine and Coastal Law (2023). https://doi.org/10.1163/15718085-bja10139; Popova et al., 2019. "So far, yet so close: Ecological connectivity between ABNJ and territorial waters" International Institute for Environment and Development Policy Brief. https://pubs.iied.org/17500iied

171 Ibid; Nakamura, J., D Diz and E Morgera. 2022. "International legal requirements for environmental and socio-cultural assessments for large-scale industrial fisheries" 31(3) Review of European, Comparative & International Environmental Law 336–348. https://doi.org/10.1111/reel.12462

172 On the relevance for fishers see Shields, S. et al. 2023. "Children's human right to be heard at the ocean-climate nexus." 38(3) The International Journal of Marine and Coastal Law, https://doi.org/10.1163/15718085-bja10140. On the relevance for fishers, see Nakamura, J. et al. 2023. "International legal responses for protecting fishers' fundamental rights impacted by a changing ocean" 38(3) The International Journal of Marine and Coastal Law, https://doi.org/10.1163/15718085-bja10141. On the relevance for Indigenous Peoples see Strand, M. et al. 2022. "Reimagining ocean stewardship: Arts-based methods to "hear" and "see" Indigenous and local knowledge in ocean management" 9 Frontiers in Marine Science 1–19, https://doi.org/10.3389/fmars.2022.886632; Strand, M. et al. 2023. "The complexity of evaluating, categorising and quantifying marine cultural heritage." Marine Policy, https://doi.org/10.1016/j.marpol.2022.105449; Rivers, N. et al. 2023. "Pathways to integrate Indigenous and local knowledge in ocean governance processes: Lessons from the Algoa Bay Project, South Africa." Frontiers in Marine Science, https://doi.org/10.3389/fmars.2022.1084674; Rivers, N. et al. 2023. "Policy brief: Integrating Indigenous and Local Knowledge in Marine Spatial Planning," available from https://www.jstor.org/stable/resrep49178.

173 Morgera, E. et al. 2023. "Ocean-based Climate Action and Human Rights Implications under the International Climate Change Regime." The International Journal of Marine and Coastal Law https://doi.org/10.1163/15718085-bja10142; see also Morgera, E. and M Lennan. 2023. "Policy brief: A Multi-Partner Coalition to Protect and Restore the Ocean's Contributions to Climate Regulation, Human Well-Being and Planetary Health," available from https://oneoceanhub.org/publications/8742/.

174 Galappaththi, Eranga K., Vasantha B. Susarla, Samantha JT Loutet, Stephanie T. Ichien, Amanda A. Hyman, and James D. Ford. 2022. "Climate change adaptation in fisheries." Fish and Fisheries 23, no. 1: 4-21.

175 IOC-UNESCO. 2022. Multiple Ocean Stressors: A Scientific Summary for Policy Makers, (eds P.W. Boyd, S. Dupont and K. Isensee). Paris, France, UNESCO, 20pp. (IOC Information Series, 1404). DOI: http://dx.doi.org/10.25607/OBP-1724

mining,[176] noise[177] and artificial light,[178] which we all need to be considered in terms of individual and cumulative impacts.[179]Another issue receiving increased attention, but for which more needs to be done, relates to equity in addressing global ocean research challenges. This relates to issues ranging from ocean monitoring and capacity building[180] to governance and research in the high seas.[181]

There are information gaps for emissions scenarios where global warming temporarily exceeds 1.5 °C above pre-industrial levels and then returns to lower warming levels. Further research on such scenarios could determine the extent of CO_2 removal measures needed, considering reduced economic and non-economic losses and damages that would otherwise occur during a period of overshoot. The capacities of sub-ocean-floor carbon capture and storage and the storage capacity and sequestration rate of blue carbon ecosystems also require consideration. Both capacities can provide an improved understanding of potential and identify proactive adaptation options for managing unavoidable losses and damages. As joint IPCC and IPBES insight emphasizes the need to solve the climate and biodiversity crises together, the role of biodiversity and the strengthening of nature's contribution to people, including mitigation and adaptation benefits, should be part of the needs formulated in the GST.

Reviewing overall progress in achieving the Global Goal on Adaptation (GGA) during the Technical Dialogue included considering efforts across the adaptation cycle and opportunities and challenges related to making adaptation more transformational. Again, differentiation for the different spaces, including the ocean, is advisable. Discussions under the Glasgow–Sharm el-Sheikh work programme on the GGA are ongoing with a view to developing a common understanding of the GGA, and focus on dimensions, themes, cross-cutting issues and sources of information for the framework for the GGA. Increasing the understanding of progress toward achieving the GGA and provision of information on adaptation in national reporting should enable a more comprehensive assessment of adaptation concerning the ocean during the second GST. The specifics as outlined for ocean climate action in the GST by literature have not been detailed in the GST technical paper.[182]

176 Amon, Diva J., Sabine Gollner, Telmo Morato, Craig R. Smith, Chong Chen, Sabine Christiansen, Bronwen Currie et al. 2022. "Assessment of scientific gaps related to the effective environmental management of deep-seabed mining." Marine Policy 138: 105006.

177 Chahouri, Abir, Nadia Elouahmani, and Hanan Ouchene. 2022. "Recent progress in marine noise pollution: A thorough review." Chemosphere 291: 132983.

178 Smyth, T.J., A. E. Wright, D. McKee, S. Tidau, R. Tamir, Z. Dubinsky, D. Iluz, T. W. Davies. 2022. A global atlas of artificial light at night under the sea. Elementa: Science of the Anthropocene 21 January 2021; 9 (1): 00049.

179 O'Hara, Casey C., and Benjamin S. Halpern. 2022. "Anticipating the Future of the World's Ocean." Annual Review of Environment and Resources 47: 291-315.

180 Van Stavel, Jordan, Cora Hörstmann, Erin Satterthwaite, Laura Elsler, Frank Muller-Karger, Mark Bushnell, Jay Pearlman et al. 2021. "Towards an increase in diversity, equity and inclusion in international ocean observing practices and initiatives. "OCEANS 2021: San Diego–Porto, pp. 1-6. IEEE.

181 Morgera, Elisa et al. 2023. "Addressing the ocean-climate nexus in the BBNJ agreement: strategic environmental assessments, human rights and equity in ocean science." The International Journal of Marine and Coastal Law 38, no. 3: 447-479.

182 Schindler Murray, L., Romero, V. and Herr, D. 2021. Unpacking the UNFCCC Global Stocktake for Ocean-Climate Action. IUCN, Rare, Conservation International, WWF, and Ocean & Climate Platform

3. THE CENTRAL ROLE OF NATIONALLY DETERMINED CONTRIBUTIONS AND OTHER NATIONAL TOOLS FOR OCEAN-CLIMATE ACTION

3.1 Actions to further improve ocean content of nationally determined contributions

This section takes an in-depth look at the current ocean content in nationally determined contributions (NDCs) to determine trends in inclusion of ocean-relevant references. This includes updates from the Ocean Conservancy's NDC Tracker, among others. It also notes trends over time in the role that the ocean plays in NDCs. Suggestions are made for further improvement of ocean content in NDCs.

A NDC is a climate pledge developed by a country detailing its efforts to reduce national emissions and adapt to the impacts of climate change. NDCs are the main tool Parties use to report on their actions and progress towards achieving the global 1.5°C goal under the Paris Agreement. The promise of the Agreement is that it created a first set of commitments, followed by a "ratchet" cycle, in which countries submit updated NDCs every five years. The outcomes of the Global Stocktake (GST), a process created to assess the progress of the global collective towards achieving the goals set by the Paris Agreement every five years, will inform the preparation of the next (and subsequent) NDCs, and help to drive increased ambition.

Despite the clear interrelationship between climate change and the ocean, the ocean-climate nexus continues to be missing from several UNFCCC processes, including the GST. The ocean must be a key element of the climate change response toolkit if we are to keep the 1.5° C goal alive and avoid the worst consequences of climate change. The synthesis report from the technical dialogue of the first GST notes that "more action is needed now, on all fronts and by all actors, if the long-term goals of the Paris Agreement are to be met."[183] Thus, it is critically important that nations increase ambition and inclusion of the ocean in NDCs, National Adaptation Plans (NAPs), and other climate communications, and to work toward the inclusion of ocean-climate metrics in the GST.

Many Parties have already included the ocean in their NDCs. The 'NDC Tracker,' originally released by Ocean Conservancy in November 2020 and updated for its current version before the Ocean and Climate Dialogue during SBSTA58 (2023), showcases ocean-based climate solutions in NDCs.[184] Although most coastal countries reference the ocean in their first round of NDCs, only a small number discuss ocean actions as a climate solution. For example, fewer than 20 percent of countries with coastal blue carbon ecosystems discussed their role as carbon sinks. The increased recognition of the linkages between the ocean and climate change, led to an effort, spearheaded by members of the Friends of the Ocean and Climate Group, to include text in the Sharm El-Sheikh Implementation Plan (2022) encouraging Parties "to consider, as appropriate, ocean-based action in their national climate goals and in the implementation of these goals, including but not limited to nationally determined contributions, long-term strategies and adaptation communications."[185] The expectation is that this text will help encourage Parties to include the ocean as part of their NDCs.

3.2 National Ocean Policies as a tool for further integrating ocean and climate action

This section explores examples of national ocean policies (NOPs) and how they take stock of climate change policies and issues. NOPs can also focus on specific processes, such as ocean acidification. The Ocean Acidification Alliance provides an example in this context. Countries with NOPs explored in this section include the Philippines, Indonesia, India and the United States.

The Ocean Acidification Alliance calls for the development of National Ocean Acidification Action Plans. A National Ocean Acidification Action Plan helps governments actively address localized manifestations of ocean acidification by increasing understanding of its impacts to their region and prioritizing mitigation, adaptation, and resilience activities nearshore.

At the national level, many country partners in the East Asia region have passed and/or adopted CCA/DRR- relevant laws, policies, and institutional arrangements and have submitted/updated their NDCs under the Paris Agreement.

Philippines

As one of the most vulnerable countries to disasters and extreme events in the world, the Philippines has developed a robust number of national policies that aim to address and mitigate the impacts of climate change in the country. The Philippines is currently in the process of completing the first draft of the country's National

183 UNFCCC Secretariat. 2023.Technical dialogue of the first global stocktake. Synthesis report by the co-facilitators on the technical dialogue. FCCC/SB/2023/9

184 Ocean Conservancy. 2023. Ocean-Based Climate Solutions in Nationally Determined Contributions: June 2023 Update. https://oceanconservancy.org/wp-content/uploads/2023/06/NDC-Tracker-June-2023.pdf

185 UNFCCC. 2022. Sharm el-Sheikh Implementation Plan. https://unfccc.int/documents/624444

Country	Sustainable development	Biodiversity	Climate change	Pollution
Cambodia	National Environment Strategy and Action Plan 2016–2023	Updated National Biodiversity Strategy and Action Plan (NBSAP) (2016)	Climate Change Strategic Plan 2014- 2023 NDC (12/31/2020; active)	National Circular Economy Strategy and Action Plan (launched in 2021)
China	14th Five-Year Plan 2021–2025	NBSAP 2011–2030	National Strategy for Climate Adaptation 2022–2035 NDC (10/28/2021; active)	14th Five-Year Plan for the Development of Circular Economy
DPR Korea	5-Year National Economic Development Plan 2021–2025	NBSAP (2007)	National Climate Change Adaptation Strategy NDC (9/19/2019; active)	National Environmental Protection Strategy
Indonesia	National Development Plan 2020–2024	NBSAP 2015–2020	National Action Plan on Climate Change Adaptation NDC (9/23/2022; active)	Plan of Action on Marine Plastic Debris 2017–2025
Japan	Third Basic Plan on Ocean Policy	NBSAP 2012-2020	Green Growth Strategy through Achieving Carbon Neutrality in 2050 NDC (10/22/2021; active)	National Action Plan for Marine Plastic Litter
Lao PDR	National Green Growth Strategy till 2030 10-Year National Socio-economic Development Strategy 2016–2025	NBSAP 2016–2025	National Strategy for Climate Change: Vision to the Year 2050, Strategy and Programs of Actions to the Year 2030 NDC (5/11/2021; active)	National Plastics Action Plan (under development)
Philippines	Philippine Development Plan 2023–2028	Philippine Biodiversity Strategy and Action Plan 2015-2028	National Climate Change Action Plan 2011–2028 NDC (4/15/2021; active)	National Action Plan for the Prevention, Reduction, and Management of Marine Litter Philippine Action Plan for Sustainable Production and Consumption
RO Korea	Third Basic Plan for Sustainable Development 2016–2035	NBSAP 2019–2023	3rd National Climate Change Adaptation Plan 2021–2025 NDC (12/23/2021; active)	National Action Plan on Marine Litter and Contaminated Sediment 2021–2030
Singapore	Singapore Green Plan 2030	NBSAP	Singapore's Climate Action Plan NDC (3/31/2020; active)	National Action Strategy on Marine Litter
Timor-Leste	Strategic Development Plan 2011–2030 National Ocean Policy 2022-2032	NBSAP 2011–2020	National Adaptation Plan NDC (8/16/2017; active)	National Action Strategy on Marine Litter
Viet Nam	Strategy on Sustainable Development of Viet Nam's Marine Economy to 2030, Vision to 2045 Green Growth Strategy 2021– 2030, Vision to 2050	NBSAP 2020–2030	National Strategy for Climate Change by 2050 NDC (9/11/2020; active)	National Action Plan for the Management of Marine Plastic Litter by 2030 National Action Plan on Sustainable Consumption and Production 2021–2030

Table 1. East Asia sustainable development, biodiversity, climate change and pollution laws, policies and institutional agreements

Adaptation Plan, which outlines mid-term and long-term strategies for adaptation, with the overarching goal of strengthening the adaptive capacities of Filipinos, particularly the most vulnerable sectors of society.

The Climate Change Act of 2009 established the Climate Change Commission as the lead policy-making body of the government tasked to coordinate, monitor, and evaluate programs and action plans relating to climate change.[186] Notable policies developed at the national level include:

- The National Framework of Strategy on Climate Change (NSFCC), formulated in 2010, which sets the

186 See https://leap.unep.org/countries/ph/national-legislation/climate-change-act-2009-republic-act-no-9729-2009 for more information on the Philippines' Climate Change Act of 2009.


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country's agenda for climate change adaptation as an anchor strategy while capitalizing on mitigating opportunities;

- The National Climate Change Action Plan 2011-2028 (NCCAP) serves as the operational Plan of the NSFCC and outlines the long-term agenda for adaptation and mitigation for 2011-2028. The NCCAP focuses on seven (7) thematic priorities, namely: Food Security, Water Sufficiency, Ecological and Environmental Stability, Human Security, Climate Smart Industries and Services, Sustainable Energy, and Knowledge and Capacity Development;
- The Philippines submitted its first NDC in 2021, setting the country's 75 percent greenhouse gas emission reduction and avoidance target for the Agriculture, Waste, Industry, Processing, and Product Use, Transport, and Energy sectors for 2020-2030; and
- The Philippine Development Plan 2023-2028 builds on key strategies for economic and social transformation while taking stock of lessons learned. The plan identifies several ocean governance priorities, with a focus on blue economy and accelerating climate action and disaster resilience, among others.

Indonesia

The Second Indonesian Ocean Policy (Kebijakan Kelautan Indonesia) is a regulatory instrument for formulating and implementing policies related to oceans across government bodies.[187] It elaborates on the country's mid-term national development plan and the national development agenda by providing finer resolution ocean development objectives. The policy has 7 pillars: 1) Management of Marine Resources and the Development of Human Resources; 2) Defense, Security, Law Enforcement and Safety at Sea; 3) Ocean Governance and Institution; 4) Economic and Infrastructure of Marine Sector and Prosperity Enhancement; 5) Management of the Ocean Space and Protection of Marine Environment; 6) Maritime Culture; and 7) Maritime Diplomacy.

With blue economy as one of its guiding principles, some key priority programs that recognize the critical role of coastal and marine ecosystems in mitigating greenhouse gas emissions in the atmosphere include ocean spatial management to protect marine and coastal natural resources and environments and protection of the marine environment through the reinforcement of conservation, management and protection of coastal and marine ecosystems.

Submitted to the UNFCCC in 2021, Indonesia's NDC has committed to protecting and maintaining the ecosystem services of key terrestrial, coastal and marine ecosystems and becoming a carbon sink by 2030 through priority programs such as social forestry, coastal zone protection, ecosystem conservation and restoration, integrated watershed management, and climate resilient cities.

187 COORDINATING MINISTRY FOR MARITIME AFFAIRS REPUBLIC OF INDONESIA. 2017. Indonesian Ocean Policy. https://maritim.go.id/konten/unggahan/2017/07/offset_lengkap_KKI_eng-vers.pdf

India

At the UN climate talks in Glasgow in 2021, Indian Prime Minister Narendra Modi announced that his country would achieve net-zero on greenhouse gas emissions by the year 2070.[188] The government's commitments on low-carbon emissions include: a) a target of a 45% reduction of emissions per unit of gross domestic product (GDP) by 2030, relative to the year 2005; b) increase of solar, wind, nuclear and hydropower use, to half of the country's electricity capacity; c) increase to more than triple the capacity for generating non-fossil electricity capacity to 500 gigawatts by 2030; and d) allocate $2.5 billion to manufacture energy storage.

The passage of the *Energy Conservation Amendment*, by Indian Parliament,[189] is aimed at achieving higher renewable power purchase targets for industries, large residential buildings and energy consumption standards for vehicles and vessels. It also empowers the government to create a national carbon trading market.

However, some argue that the transition to low-carbon development in India will be a serious challenge, where the cost of capital is high, institutions are often weak, and citizens are ill-equipped to bear the cost of economic shocks. [190] Others note that in the second most populous nation in the world, which is one of the biggest emerging economies, the government may speak and act at cross purposes.[191]

United States

President Joe Biden issued an Executive Order on June 8, 2023 to promote and implement, a) the *Climate Policy and Ocean Climate Action Plan (OCAP) 2022* to guide ocean-based climate mitigation and adaptation actions, including green shipping, ocean-based renewable energy, and blue carbon; b) develop a *National Sustainable Ocean Plan,* to help guide sustainable economic development of U.S. Ocean and Coastal waters; and c) expand ongoing work to harness the clean energy potential of the ocean, and conserve and restore the ocean's health and productivity.[192]

The OCAP outlines three goals that mobilize the federal government and civil society to take effective and innovative ocean climate action: 1) create a carbon-neutral future; 2) promote harnessing the power of coastal and ocean systems to absorb and store greenhouse gases; and

3) develop ocean-based solutions to enhance community resilience to adapt to climate change. Four priority actions to achieve those goals include: 1) increasing offshore wind and marine energy; 2) decarbonizing the maritime shipping sector; 3) conserving and restoring coastal and marine habitats that store "blue carbon"; and 4) expanding Marine Protected Areas to enhance resilience of ocean ecosystems that provide food, jobs and recreational opportunities. OCAP emphasizes a commitment to be responsible stewards of a healthy and sustainable ocean, advance environmental justice and engage with communities and Indigenous People.

Ocean-related GDP has grown twice as much faster than the total U.S. GDP. The economic activity of seaports has grown 17% from 2014-2018 to $5.4 trillion, comprising nearly 26% of the nation's $20.5 GDP. The blue economy supports 2.4 million jobs and contributes $397 billion to the nation's GDP through tourism, shipping, commercial and recreational fishing, and power generation.[193] However, threats to ocean resources are many, including: a) rise in sea levels; b) oxygen depletion through agricultural effluents, sewage from factories a nd industrial plants; c) oil spills; and d) overfishing and illegal fishing.[194]

3.3 Summary of achievements and future needs

National tools for ocean-climate action include Nationally Determined Contributions (NDCs) and National Ocean Policies (NOPs). NDCs are climate pledges developed by countries detailing efforts to reduce national

188 Dubash, N.K. 2021. Climate Fault lines: India's lessons from the Glasgow Climate Negotiations. www.casi/sas/upen.edu

189 Singh, M.K. Water and Energy International. 2022. www.indianjournals.com

190 Dubash, Swain and Bhatiya. 2019. The Disruptive Politics of Renewable Energy. The India Forum. www.theindiaforum.in

191 Lewis, Marlo. 2009. "India's Tripled CO2 emissions by 2030: A "Carbon Constrained' World?". www.masterresource.org

192 The White House Ocean Policy Committee. 2023. Ocean Climate Action Plan. www.whitehouse.gov/wp-content/uploads/2023/03/Ocean-Climate-Action-Plan_Final.pdf

193 NOAA. 2023. New Blue Economy. www.noaa.gov/blue-economy

194 NOAA Fisheries. Threats to Habitat. www.fisheries.noaa.gov/insight/threats-habitat

emissions and adapt to the impacts of climate change. NDCs are the main tool Parties use to report on their actions and progress towards achieving the global 1.5°C goal under the Paris Agreement. NOPs take stock of climate change policies and issues in relation to the ocean and provide a tool for integrating NDCs and climate policies with ocean policies. In the period of 2022-2023, continued development of NDCs led to the following achievements and lessons learned:

- Fewer than 20 percent of countries with coastal blue carbon ecosystems discussed their role as carbon sinks, highlighting a continued need for increased recognition of the ocean-climate nexus across Parties.
- Efforts led by the Friends of the Ocean and Climate Group resulted in text in the Sharm El-Sheikh Implementation Plan (2022) encouraging Parties to incorporate ocean-based action in their national climate goals.
- The Ocean Conservancy's 'NDC Tracker' was updated before the 2023 Ocean and Climate Dialogue during SBSTA58 to showcase ocean-based climate solutions in NDCs and serve as a tool to encourage Parties to include the ocean as part of their NDCs.

NOPs developed by the Philippines, Indonesia, India and the United States include important updates in the period of 2022-2023.

The Philippines' first draft of the country's National Adaptation Plan is in progress with the overarching goal of strengthening the adaptive capacities of Filipinos, particularly the most vulnerable sectors of society. Ongoing development of the NDC, National Climate Change Action Plan (2011-2028) and Philippine Development Plan (2023-2028) includes ocean governance priorities such as capacity development, emission reduction, blue economy, and disaster resilience.

In Indonesia, their second Ocean Policy includes key priority programs that recognize the critical role of coastal and marine ecosystems in mitigating greenhouse gas emissions in the atmosphere through ocean special management and stronger protections for coastal and marine ecosystems. Indonesia's NDC has committed to protecting and maintaining the ecosystem services of coastal and marine ecosystems and becoming a carbon sink by 2030.

India's NOP is now articulated in its "National Maritime Security Policy and Strategy", which aims to ensure a safe, secure and stable Indian Ocean Region and recognizes the ocean as a shared resource and promotes sustainable extraction practices.

In the United States, an Executive Order issued on June 8, 2023 promotes and implements the "Climate Policy and Ocean Climate Action Plan" and "National Sustainable Ocean Plan" to guide ocean-based climate mitigation and adaptation actions and guide sustainable economic development of U.S. marine and coastal waters. Additional support is included to harness the clean energy potential of the ocean and conserve and restore the ocean's health and productivity.

4. MITIGATION

Section 4 focuses on mitigation measures based on the following recommendations from the ROCA initiative: *Further develop and apply mitigation measures using the oceans, such as implementing "Blue Carbon Policies," reducing CO2 emissions from ships, developing ocean-based renewable energy, and considering (long-term no-harm) ocean-based carbon capture and storage. Encourage all nations to reduce CO2 emissions so that the Paris Agreement to limit emissions to well below 2 C can be achieved, ideally holding to 1.5 C.*

4.1 Implementing "blue carbon" policies and "nature-based solutions"

Nature-based Solutions (NbS) for addressing climate mitigation and adaptation have become increasingly prominent strategies for climate mitigation.[195] Mitigation actions through management interactions (conservation and/or restoration) in the coastal and marine ecosystems are often referred to as "blue carbon".

Coastal blue carbon ecosystems, such as mangroves, seagrasses and tidal marshes, can sequester and store more carbon per unit area than terrestrial forests[196] and are recognized for their climate mitigation value by the Intergovernmental Panel on Climate Change (IPCC).[197] These blue carbon ecosystems are already included in some countries' NDCs to the Paris Agreement, national greenhouse gas (GHG) Inventories, and other climate mitigation mechanisms. Coastal blue carbon ecosystems also provide numerous other services which are applicable to climate adaptation policies, such as National Adaptation Plans (NAPs). New reports by the United Nations Environment Programme (UNEP)[198] and by UNESCO[199] emphasize that protecting and restoring these ecosystems not only contributes to climate change mitigation and adaptation, but also to achieving several national targets in relation to the SDGs. An analysis of the new or updated nationally determined contributions (NDCs) ahead of COP26 in 2021 found out that 45 out of 118 countries included the conservation and restoration of coastal blue carbon ecosystems as mitigation components of their new or updated NDCs submitted as part of the first revision cycle.[200]

International efforts to increase countries' commitments towards blue carbon ecosystems are led by the International Partnership for Blue Carbon (IPBC). Launched at UNFCCC COP21 in 2015 by nine founding partners,[201] the Partnership now has over 50 Partners, including 17 country government agencies. The Partnership is coordinated by the Australian Government with the support of IOC-UNESCO.

At the national level, highlights from the Western Indian Ocean include Kenya, with its National Mangrove Ecosystem Management Plan (2017-2027),[202] and Madagascar, which has started the elaboration of a national mangrove strategy with effective involvement of stakeholders and good collaboration between ministries. Mozambique is at an advanced stage of developing its Maritime Space Ordinance Plan (POEM),[203] and key areas for mangrove protection were taken into consideration. This is an integral part of the implementation of the National Mangrove Management Strategy approved in 2020, where Mozambique's government prioritized its mangrove and coastal areas in policy. Sri Lanka adopted a national strategic action plan for the conservation and sustainable use of mangrove ecosystems and published national guidelines for the restoration of mangroves. In early 2023, Costa Rica adopted the National Blue Carbon Strategy as part of the implementation of the NDCs to the Paris Agreement.

Regarding conservation, successful projects are being implemented globally with a few projects offering carbon credits. In May 2021, the Blue Carbon Project in the Gulf of Morrosquillo in Colombia was registered under the Verra standard.[204] The project was developed by Conservation International (CI) with the technical support of South Pole using Verra methodology. Almost one million tonnes of carbon dioxide will be sequestered over 30 years by conserving and sustainably managing 7,561 hectares of coastal mangrove ecosystem, marshes, and associated streams. The mangrove conservation project in Vanga Bay, Kenya[205] is verified by the Plan Vivo carbon trading standard. It builds on the success of a similar project in Gazi, a community just a few kilometers north, which has been trading mangrove carbon credits since 2012 on the Voluntary Carbon Market.[206]

195 For Nature-based Solutions definition see Resolution WCC-2016-Res-069-EN

196 McLeod, E., Chmura, G.L., Bouillon, S., Salm, R., Björk, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H. and Silliman, B.R., 2011. A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2. Frontiers in Ecology and the Environment, 9(10), pp.552-560

197 IPCC. 2014. 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands, Hiraishi, T., Krug, T., Tanabe, K., Srivastava, N., Baasansuren, J., Fukuda, M. and Troxler, T.G. (eds). Published: IPCC, Switzerland

198 United Nations Environment Programme. 2020. Out of the blue: The value of seagrasses to the environment and to people. UNEP, Nairobi

199 UNESCO. 2020. UNESCO Marine World Heritage: Custodians of the globe's blue carbon assets. Paris, France.

200 Lecerf, M., Herr D., Thomas, T., Elverum, C., Delrieu, E. and Picourt, L., 2021. Coastal and marine ecosystems as Nature-based Solutions in new or updated Nationally Determined Contributions, Ocean & Climate Platform, Conservation International, IUCN, GIZ, Rare, The Nature Conservancy and WWF

201 See https://bluecarbonpartnership.org for more information on the IPBC.

202 GoK. 2017.National Mangrove Ecosystem Management Plan. Kenya Forest Service, Nairobi, Kenya

203 See MSProadmap for more information on Mozambique's marine spatial plan https://www.mspglobal2030.org/msp-roadmap/msp-around-the-world/africa/mozambique/

204 Verra. 2021. News Release. Verra Has Registered Its First Blue Carbon Conservation Project. https://verra.org/press-release-verra-has-registered-its-first-blue-carbon-conservation-project/

205 Ibid.

206 Plan Vivo. 2013. MIKOKO PAMOJA – KENYA. https://www.planvivo.org/mikoko-

The Blue Natural Capital Financing Facility (BNCFF),[207] managed by IUCN, is supporting three large-scale blue carbon projects[208] in Indonesia, Zanzibar and Kenya. Established by Australia and IUCN, the Blue Carbon Accelerator Fund (BCAF)[209] currently supports eight different mangrove and seagrass conservation and restoration projects in Benin, Indonesia, Madagascar, Papua New Guinea, Peru and the Philippines. IUCN's LIFE Blue Natura project in the Mediterranean quantifies the carbon deposits and the sequestration rates of seagrass meadows and marsh habitats in Andalusia, Spain, while also addressing legal, policy and financing questions which can facilitate the enabling frameworks for the protection and conservation of this important habitat. From a scientific perspective, research efforts are increasingly directed towards emerging blue carbon ecosystems, such as macroalgae (including kelp and seaweed farms), benthic sediments and mud flats.

In 2021 the International Partnership on Marine Protected Areas, Biodiversity and Climate Change launched its website with supporting materials for decision-makers, negotiators, and marine protected area (MPA) managers on the role MPAs can play to address biodiversity and climate change.[210] Case studies highlight how MPA networks can protect blue carbon habitats and can prevent loss and degradation of those habitats and their associated blue carbon reserves. Partners have shared methodologies for assessing MPA blue carbon habitats, which has resulted in the greater understanding of the role of marine sediments in long-term storage of carbon and the lack of protection for some of these habitats. Understanding the extent to which blue carbon habitats are already protected within existing MPA networks can identify potential gaps in existing protections. The United Kingdom's Joint Nature Conservation Committee's sharing of the importance of carbon storage in offshore sediments led to the National Oceanic and Atmospheric Administration's (NOAA) development of a methodology for calculating ocean sediment carbon storage. The long-term storage of carbon sequestered in the ocean's sediments represents the largest non-fossil pool of organic carbon on the planet. Due to their extensive area, seabed sediments represent a large and globally important carbon store and long-term sink. The methodology can be applied to understand the carbon stores in existing MPAs to ensure adequate benthic habitat protections and can be applied when selecting and designing new MPAs.

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207 For more information, visit: https://bluenaturalcapital.org/bncff/

208 IUCN Blue Natural Capital. Blue Carbon. https://bluenaturalcapital.org/campaigns/blue-carbon/

209 IUCN Blue Natural Capital. Blue Carbon Accelerator Fund. https://bluenaturalcapital.org/bcaf/

210 For more information, see https://www.mpabioclimate.org

Box 1. International initiatives on blue carbon

The Blue Carbon Initiative

The Blue Carbon Initiative (BCI)[211] was established in 2010 by Conservation International, IOC-UNESCO and IUCN. It aims to mitigate climate change through the conservation, restoration and sustainable use of coastal blue carbon ecosystems, including mangroves, seagrass meadows and tidal marshes. Foremost, the BCI supports scientific research into the role of coastal blue carbon ecosystems for climate change mitigation and aims to develop comprehensive methods for assessing blue carbon stocks and emissions. It also informs the development of management approaches, financial incentives and policy mechanisms and engages local, national and international governments to promote policies that support coastal blue carbon conservation, management and financing.

The International Partnership for Blue Carbon

The International Partnership for Blue Carbon (IPBC)[212] was established in 2015 by nine founding members, following Australia's initiative, to connect governments with NGOs, intergovernmental organisations and research institutions globally. The partnership aims to sustainably manage coastal blue carbon ecosystems to improve climate change mitigation and adaptation, biodiversity, ocean economies and coastal communities' livelihoods. Through shared expertise and capacity building, the IPBC supports governments in making informed commitments and plans. It has grown to over 50 partners, including 17 governments. The IPBC provides direct access to leading global blue carbon experts and practitioners, enabling governments to stay up to date with the latest blue carbon science and policy developments.

The Global Mangrove Alliance

The Global Mangrove Alliance (GMA)[213] was formed in 2018 to increase the global area of mangrove habitat through conservation, restoration and equitable management. With over 30 members, including NGOs, governments, scientists, industry and local communities, the alliance coordinates initiatives and shares best practices. The GMA curates ***The State of the World's Mangroves*** report and the remote-sensing data and monitoring platform Global Mangrove Watch, providing open access to data on habitat extent, change, alerts, biomass, height and blue carbon.

The International Partnership on Marine Protected Areas, Biodiversity and Climate Change

The International Partnership on Marine Protected Areas, Biodiversity and Climate Change[214] was formed in 2020 by the Ministry of the Environment of Chile, Joint Nature Conservation Committee of the United Kingdom, French Biodiversity Agency of France, Ministry for the Environment and Energy of Costa Rica, and the National Oceanic and Atmospheric Administration of the United States with technical expertise from the International Union for the Conservation of Nature and the Marine Alliance for Science and Technology of Scotland at COP25. Formally launched in 2021, the goals of the Partnership include facilitating decision makers' understanding of the link between the ocean, MPAs, and climate with the support needed to implement MPAs as a nature-based solution; linking MPAs, biodiversity and climate change as a contribution to national and international commitments; and ensuring that countries globally have the evidence and tools needed to implement effective MPA networks that mitigate climate change, conserve biodiversity, and increase resilience.

The Blue Carbon Inventory Project

The Blue Carbon Inventory Project[215] is an ongoing initiative funded by the U.S. Department of State and implemented by the National Oceanic and Atmospheric Administration (NOAA) and their partners. Initiated in 2020, the Blue Carbon Inventory Project seeks to enhance the co-benefits of coastal ecosystems for mitigation and adaptation in partner countries and regions by supporting the accurate and transparent tracking and reporting of coastal blue carbon in national inventories. Specifically, the project provides countries with technical support on the inclusion of coastal blue carbon ecosystems in national greenhouse gas inventories and the long-term sustainable management of such ecosystems. These efforts are a part of the Transparency Accelerator for Greenhouse Gas Inventories, a broader U.S. program, and is intended to advance the development of emissions mitigation, coastal resource management and resilience strategies that reflect the value of coastal ecosystems in carbon storage and sequestration.

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211 See https://www.thebluecarboninitiative.org for more information
212 See https://bluecarbonpartnership.org for more information
213 See https://www.mangrovealliance.org for more information
214 See https://www.mpabioclimate.org for more information
215 See https://cpo.noaa.gov/wp-content/uploads/2023/08/NOAA_BCIproject_BriefingSheet_2023_07_13.pdf for more information

4.2 Reducing CO_2 emissions from ships

International shipping is the main pillar of global commerce. As a global network connecting States, shipping has a key role to play in the development of a sustainable economy.

The International Maritime Organization (IMO) is a specialized United Nations agency and the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented.

For over a decade, the IMO has been committed to cutting GHG emissions from ships.[216] Shipping is the most cost-effective and energy efficient mode of mass cargo transport, and since 2009, the increase of CO_2 emissions of international maritime transport has been effectively decoupled from the continuously growing global seaborne trade volume. However, the Fourth IMO GHG Study in 2020 estimated that carbon dioxide emissions from international shipping still accounted for between 2% and 2.5% of global anthropogenic emissions (being voyage-based and vessel-based allocations respectively).[217]

In July 2023, IMO's Marine Environment Protection Committee adopted the 2023 IMO Strategy on Reduction of GHG Emissions from Ships. This confirmed and strengthened IMO's commitment to phase out GHG emissions from international shipping while promoting a just and equitable transition.[218] The 2023 IMO Strategy builds upon the Initial IMO Strategy, adopted in 2018, and represents a framework for Member States. This framework establishes a future vision for international shipping, including levels of ambition to reduce GHG emissions and candidate mid- and long-term measures with possible timelines and assessments of their impacts on States.

Since the adoption of the Initial Strategy, IMO has been actively working on transposing the strategically defined levels of ambition to mandatory requirements that apply to individual ships. These efforts will ensure that the levels of ambition are effectively achieved in line with the agreed timelines. As such, IMO's commitments go beyond aspirational targets and outline a binding regulatory framework that applies to the world fleet with global enforcement. Worldwide application of regulations provides a level playing field and prevents distortion of specific trade flows and trade agreements. This avoids potential pitfalls, such as carbon leakage or sub-optimal shipping.

216 IMO. 2023. IMO's work to cut GHG emissions from ships. https://www.imo.org/en/MediaCentre/HotTopics/Pages/Cutting-GHG-emissions.aspx

217 IMO. 2020. Fourth Greenhouse Gas Study. https://www.imo.org/en/OurWork/Environment/Pages/Fourth-IMO-Greenhouse-Gas-Study-2020.aspx

218 See more about MEPC 80/WP.12 at: https://wwwcdn.imo.org/localresources/en/MediaCentre/PressBriefings/Documents/Resolution%20MEPC.377%2880%29.pdf

Following COP26, IMO Member States worked constructively to ensure that the Organization remained on track with the implementation of the 2018 Initial IMO GHG Strategy and adoption of the 2023 IMO Strategy. The Organization made the following progression, inter alia:

At the Marine Environment Protection Committee (MEPC) 80 IMO Member States adopted the 2023 IMO Strategy on Reduction of GHG Emissions from Ships, with enhanced targets to tackle harmful emissions.[219] The revised IMO GHG Strategy[220] includes an enhanced common ambition to reach net-zero GHG emissions from international shipping close to 2050, a commitment to ensure an uptake of alternative zero and near-zero GHG fuels by 2030, as well as indicative checkpoints for international shipping to reach net-zero GHG emissions for 2030 and 2040. In particular, the 2023 IMO GHG Strategy envisages a reduction in carbon intensity of international shipping by at least 40% on average by 2030. It is envisaged that a review of the 2023 IMO GHG Strategy will be finalized when the Marine Environment Committee meets in autumn 2028, with a view to adoption of the 2028 IMO Strategy on reduction of GHG emissions from ships. The 2023 IMO GHG Strategy was submitted to the first Global Stocktake (GST) and can be found on the UNFCCC platform.[221]

Life cycle GHG assessment of marine fuels is a prerequisite for the uptake of zero- and near-zero GHG emission fuels.[222] MEPC 80 adopted Guidelines on life cycle GHG intensity of marine fuels (Life Cycle Assessment or LCA guidelines) (resolution MEPC.376(80)). MEPC 80 also requested the Secretariat to undertake a review of existing practices on sustainability aspects/certification and third-party verification issues and to organize an expert workshop on the life cycle GHG intensity of marine fuels. The further development of the LCA framework will be discussed at ISWG-GHG 16 to be held in March 2024.

Detailed consideration has been given to proposals for mid- and long-term measures[223] aimed at supporting the achievement of the vision and the levels of ambition agreed in the Initial Strategy and enhanced by the 2023 IMO GHG Strategy. The work has been undertaken in accordance with the work plan for development of mid- and long-term measures approved by MEPC 76. The *2023 IMO Strategy on Reduction of GHG Emissions from Ships* states that a basket of candidate measure(s), delivering on the reduction targets, should be developed and finalized. This should be comprised of both a technical element, namely a goal-based marine fuel standard regulating the phased reduction of the marine fuel's GHG intensity, and an economic element, based on a maritime GHG emissions pricing mechanism.

The candidate economic elements will be assessed observing specific criteria to be considered in the comprehensive impact assessment, with a view to facilitating the finalization of the basket of measures. A Steering Committee on the comprehensive impact assessment of the basket of candidate mid-term measures was established in September 2023 to conduct the comprehensive impact assessment in accordance with the Procedure for assessing impacts on States of candidate measures[224] and approved terms of reference. The Steering Committee will submit its interim report to MEPC 81 for consideration. In line with the Initial Strategy and 2023 IMO Strategy, particular attention should be paid to the needs of developing countries, in particular SIDS and least developed countries (LDCs). The 2023 IMO Strategy contains key stages towards the adoption of a 2028 IMO GHG Strategy, which envisages the mid-term measures to be approved at MEPC 83 (Spring 2025) for adoption at an extraordinary session of the MEPC. The extraordinary session will be specially convened in Autumn 2025 to allow for the entry into force of the measures in 2027.

MEPC 80 also approved draft amendments to the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI regarding the revision of the IMO ship fuel oil consumption Data Collection System (DCS).[225] ISWG-GHG 14 in March 2023 discussed relevant proposals, noting broad support within the Group for the inclusion of data on transport work and on enhanced level of granularity of reported data in the DCS. The draft amendments relate to MARPOL Annex VI Appendix IX on "Information to be submitted to the IMO Ship Fuel Oil Consumption Database" (relating to regulation 27), relating to reporting of data on cargo carried. They will be put forward to MEPC 81 for adoption.

Finally, MEPC 80 considered various submissions related to onboard CO2 capture. If time permits, ISWG-GHG 16will consider the proposals related to onboard CO2 capture ahead of MEPC 81 and advise the Committee on a way forward. The submissions include those relating to onboard carbon capture (OCC) technology and

219 Ibid.

220 Ibid.

221 IMO. 2023. SUBMISSION OF THE INTERNATIONAL MARITIME ORGANIZATION TO THE FIRST GLOBAL STOCKTAKE. https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202309140934---IMO%20submission%20to%20GST1.pdf

222 IMO. Guidelines on life cycle GHG intensity of marine fuels (LCA guidelines) https://www.imo.org/en/OurWork/Environment/Pages/Lifecycle-GHG---carbon-intensity-guidelines.aspx

223 IMO. 2021. Work plan for the development of mid- and long-term measures as a follow-up of the initial IMO strategy on reduction of GHG emissions from ships. MEPC 76/15/Add.2 annex 14, page 1. https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air%20pollution/Work%20Plan.pdf

224 See https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/MEPC.1-Circ.885-Rev.1.pdf

225 See https://www.imo.org/en/OurWork/Environment/Pages/Data-Collection-System.aspx

a proposal to review the current regulatory framework and consider how to move forward to potentially accommodate onboard CO2 capture within IMO's regulatory framework.

4.3 Developing ocean-based renewable energy

The ocean has the potential to be a major source of renewable energy in the coastal regions. In addition to providing carbon-free energy, marine renewable energy resources (MREs) can contribute to socio-economic development, energy security and energy access in the small island developing States (SIDS) and other emerging economies. Various MREs are evolving at different speeds. Offshore wind is currently the most mature and widely deployed technology. Wave and tidal energy are rapidly transitioning from the demonstration phase to commercial deployment while technologies such as ocean current, ocean thermal energy conversion (OTEC) and osmotic power are at a research and demonstration phase. Various countries have established regulatory frameworks to lease offshore areas and manage resource development while tax credits and financial incentives have been extended to MREs to bridge the viability gap. Conditions are now favourable for large-scale deployment of mature MREs technologies such as offshore wind power.

Offshore wind is a significant renewable resource that can meet significant energy demand of many coastal regions. According to the 2023 Global Offshore Wind Report, a total of 64.3 GW of offshore wind capacity across nineteen countries was in operation by the end of 2022, accounting for 7.1% of global wind power installation.[226] The report highlights that more than 380 GW of new offshore capacity is proposed around the world. Almost all existing offshore wind projects are in relatively shallow waters, (less than 60 meters depth), using fixed bottom foundations. The industry is now expanding into deeper waters, such as offshore California, where leases were awarded in early 2023 for utility-scale projects. These projects will deploy technically challenging floating wind turbine technology, which is still evolving and expected to mature by end of this decade. Moreover, the floating wind turbines are currently more expensive compared to the fixed bottom foundations so financial challenges will also have to be resolved before floating wind projects can be deployed at scale.

Tidal power is site specific and depends on the availability of strong tidal flows amplified by factors such as funneling in estuaries. Multiples sites have been identified in Northern Ireland, Russia, China, France and Korea to harness tidal energy. The first utility-scale tidal power project, Rance tidal power station in France, became operational in 1967 with an installed capacity of 240 MW. In 2011, Sihwa Lake tidal power project commenced operation as the largest tidal energy project with an operational capacity of 254 MW. Lack of suitable sites is a major limiting factor in the expansion of tidal power. To overcome this constraint, in 2008, a 1.2 MW Seagen tidal turbine was installed in Northern Ireland, UK to tap into fast flowing tidal currents through Strangford Lough channel. The turbine was successfully decommissioned in 2019 after operating for more than a decade and providing valuable technical data.

Wave energy can be harnessed using floating or fixed conversion devices. Various wave energy converters (WECs) are in operation at a demonstration phase including the WaveSub device off the coast of Wales installed by the Marine Power Systems.[227] In 2021, the Bureau of Ocean Energy Management (BOEM) in the United States issued a lease to Oregon State University for the PacWave South Project.[228] The lease area will be used as an open wave energy test center for various WECs designs and to assess environmental impacts. Commercial deployment of WECs using proven designs is expected in the near future.

While significant advances have been made in installing MREs, particularly offshore wind, more research is required to fully understand the environmental impacts of large-scale deployment in various ecosystems. Additional analysis is also needed to seamlessly integrate large-scale MREs in the existing electrical grid, which is designed around fossil fuel-based generation. One way to bridge this gap is to conduct grid integration studies and develop public-private partnerships for long-term environmental monitoring and mitigation initiatives. MRE installation and deployment is highly complex and requires significant upfront capital investment. Supply chain constraints and high interest rates in recent times have particularly impacted the financial viability of MRE projects. As a result, project developers are increasingly seeking state support to bridge the financial viability gap. Such support is likely to be crucial for continued deployment of offshore wind projects and other MRE projects around the world.

226 Global Wind Energy Council (GWEC). 2023. Global Offshore Wind Report 2023. Accessed from https://gwec.net/gwecs-global-offshore-wind-report-2023/

227 Marine Power Systems. 2021. WaveSub: Project Information Summary. 2021. Access from https://marine.gov.scot/sites/default/files/20211019_mps_pis_v3final.pdf

228 Bureau of Ocean Energy Management (BOEM). 2021. Oregon State University, research lease of submerged lands for renewable energy development on the Outer Continental Shelf. Accessed from https://www.boem.gov/renewable-energy/state-activities/p0560-osu-executed

4.4 Considering ocean-based carbon capture and storage

There is considerable theoretical potential to store CO_2 (once captured and compressed) in the sub-seabed of the ocean. Carbon capture and storage, or "sequestration", is a climate change mitigation technique known as CCS. This process which allows CO_2 emissions to be captured at source and then injected in carefully selected sub-seabed rock formations, typically a few kilometers below the seafloor. Depleted oil and gas fields, for example, can provide permanent storage for CO_2 waste. The technique may be appropriate for large, single point CO_2 emission sources such as power stations, chemical and cement plants and steelworks.

The regulatory framework in international environmental law to allow CO_2 storage beneath the seabed, when it is safe to do so, is provided by the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972, herein the London Protocol. Its amendment in 2006 regulates the injection of CO_2 waste streams into sub-seabed geological formations for permanent isolation.[229] The London Protocol prohibits the export of wastes or other matter for dumping in the marine environment. However, in 2009, Parties to the London Protocol agreed an amendment to allow sub- seabed geological formations for sequestration projects to be shared across national boundaries. This effectively allows CO_2 streams to be exported for CCS purposes, provided that the protection standards of all other requirements under the London Protocol have been met. The CO_2 export amendment to the London Protocol is not yet in force.

In 2019 the Meeting of Contracting Parties to the London Protocol adopted a resolution to allow provisional application of the 2009 amendment. The adoption of the resolution removed a barrier for countries who wish to make use of carbon capture and storage but lack ready access to offshore storage sites within their national boundaries. All conditions set by the London Protocol must be adhered to, and Contracting Parties must deposit a declaration of provisional application with IMO. To date, ten States have accepted the 2009 amendment and seven States have deposited declarations of provisional application.

Noting that the application of the London Convention and London Protocol (LC/LP) CO_2 Sequestration Guidelines was of increasing interest and urgency, the 2023

229 IMO. 1996. 1996 PROTOCOL TO THE CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER, 1972. https://www.epa.gov/ocean-dumping/1996-protocol-convention-prevention-marine-pollution-dumping-wastes-and-other-matter

joint session of LC/LP Scientific Groups established a Correspondence Groups on Experiences with the Carbon Dioxide Streams Assessment Guidelines. Under the co-lead of Japan and Australia, the Correspondence Groups will collect information regarding experiences with the application of the carbon dioxide streams assessment guidelines.

4.5 Examples of ocean-related mitigation

Despite being a minor contributor to global carbon emissions, there are various decarbonization opportunities along the aquatic food value chain to contribute to the achievement of the 1.5 degrees Celsius climate goal.[230] Energy saving solutions include using lighter netting materials, reducing vessel or gear speed, timely cleaning of hull bottoms from fouling, and regular servicing of the engine. From 2022 to 2023, the Food and Agriculture Organization of the United Nations (FAO), in close collaboration with the Bay of Bengal Programme – Intergovernmental Organization (BOBP-IGO), has promoted simple measures for fuel saving in Sri Lanka and India using a technical manual.[231] Effective fisheries management measures that reduce fishing pressure and increase stock biomass will also lead to less fuel use and lower GHG emissions, with an estimated 13% increase in catch using 56% of the effort, corresponding to a 50% reduction in GHG emissions.[232] Industrial fishing fleet electrification is another measure to reduce GHG emissions, though progress is slow due to limited government support. Various technologies like lithium-ion battery-powered ships, hydrogen fuel cell-equipped vessels, and solar-powered boats with lithium-ion batteries are undergoing trials in a few places. Additionally, hybrid solutions, including vessels with battery packs and a diesel engine, are being tested.[233]

In the aquaculture sector, GHG emissions mainly come from feed production, followed by aquatic N_2O emissions and on-farm energy uses.[234] There is significant potential to decarbonize aquaculture production and provide low-carbon, high-quality nutrition.[235] Modelling suggests that a reduction of 21% in CO_2 emissions per tonne of fish production can be achieved by combining approaches of improving efficiency of input use (e.g. water, feed, energy, fertilizers), shifting energy support from fossil fuel to renewable, adopting best practices to improve feed conversion rates and replacing fishmeal and fish oil with crop-based ingredients.[236] Boosting production of lower trophic species, such as algae and bivalves, and integrated multi trophic aquaculture (IMTA), such as fish-rice and shrimp-mangrove cultivation, can further reduce GHG emissions from aquaculture systems.[237] Post-harvest activities can optimize their operations by incorporating renewable energy sources and enhancing energy efficiency through the adoption of climate-smart technologies. These technologies include methods that reduce the reliance on fuelwood, harness renewable energy through solar dryers or convert waste into fuel by employing biodigesters. A relevant FAO project is titled "Implementing the Small-Scale Fisheries Guidelines for gender-equitable and climate-resilient food systems and livelihoods", which supports women in gaining access to more efficient ovens for fish smoking.[238] A recent FAO publication has also identified opportunities for renewable energy interventions along the small-scale fish value chains and discussed main challenges including cost and financing, policy environment and local capacity, as well as awareness and acceptance of technology.[239]

Another mitigation strategy is to explore opportunities for fisheries and aquaculture to contribute to carbon sequestration and blue carbon ecosystems. NbS offer integrative systems that sequester significant amounts of carbon, while providing multiple ecological benefits. In the Philippines, FAO has supported the development of a climate smart Small Pelagic Fisheries Management Plan in Zamboanga del Norte, which includes a Coastal and Marine Ecosystems Restoration Plan, with funding support from the Norwegian Agency for Development Cooperation (NORAD). This plan involves restoring mangrove areas, creating a mangrove nursery, and de-

230 He, P., Davy, D., Sciortino, J., Beveridge, M.C.M., Arnason, R., and Gudmundsson, A. Chapter 27: Countering climate change: measures and tools to reduce energy use and greenhouse gas emission in fisheries and aquaculture. In: Barange, M., Bahri, T., Beveridge, M.C.M., Cochrane, K.L., Funge-Smith, S. & Poulain, F., eds. 2018. Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options. FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO. 628 pp. https://www.fao.org/3/i9705en/I9705EN.pdf

231 FAO. 2012. Fuel savings for small fishing vessels: a manual. https://www.fao.org/documents/card/en?details=98995c6b-bd40-56c7-bcf5-768c1d8eccc1

232 Gephart, J.A., Henriksson, P.J., Parker, R.W., Shepon, A., Gorospe, K.D., Bergman, K., Eshel, G., Golden, C.D., Halpern, B.S., Hornborg, S., Jonell, M., Metian, M., Mifflin, K., Newton, R., Tyedmers, P., Zhang, W., Ziegler, F. & Troell, M. 2021. Environmental performance of blue foods. Nature, 597(7876), pp.360-365. https://doi.org/10.1038/s41586-021-03889-2

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234 MacLeod, M.J., Hasan, M.R., Robb, D.H. and Mamun-Ur-Rashid, M., 2020. Quantifying greenhouse gas emissions from global aquaculture. Scientific reports, 10(1), p.11679. https://doi.org/10.1038/s41598-020-68231-8

235 Cochrane, K.L., Bahri, T., Dabbadie, L., Fernandez-Reguera, D., Kalikoski, D.C., Ma, X., Vannuccini, S. 2023. The impact of climate change on coastal fisheries and aquaculture. Reference Module in Earth Systems and Environmental Sciences. Elsevier. ISBN 9780124095489. https://doi.org/10.1016/B978-0-323-90798-9.00008-1

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237 He, P., Davy, D., Sciortino, J., Beveridge, M.C.M., Arnason, R., and Gudmundsson, A. Chapter 27: Countering climate change: measures and tools to reduce energy use and greenhouse gas emission in fisheries and aquaculture. In: Barange, M., Bahri, T., Beveridge, M.C.M., Cochrane, K.L., Funge-Smith, S. & Poulain, F., eds. 2018. Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options. FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO. 628 pp. https://www.fao.org/3/i9705en/I9705EN.pdf; TNC, 2021. Global Principles of Restorative Aquaculture. The Nature Conservancy, Arlington, VA. https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_PrinciplesofRestorativeAquaculture.pdf ; European Commission. 2022. The EU blue economy report 2022. https://data.europa.eu/doi/10.2771/793264

238 See https://www.fao.org/voluntary-guidelines-small-scale-fisheries/resources/detail/en/c/1607567/

239 Puri, M., Kojakovic, A., Rincon, L., Gallego, J., Vaskalis, I. & Maltsoglou, I. 2023. The small-scale fisheries and energy nexus – Opportunities for renewable energy interventions. Rome, FAO. https://doi.org/10.4060/cc4903en

veloping unified coastal marine resource management programmes to protect and restore essential fish habitats. Proposals have also been made to develop macroalgae aquaculture as an option of marine biomass carbon dioxide removal (CDR), by sinking cultured macroalgae into the deep sea or using marine algae for biochar.[240]

4.6 Summary of achievements and future needs

Nature-based solutions (NbS) and blue carbon have become increasingly prominent strategies for climate mitigation. New technologies and ambitions are driving change in the maritime and ocean renewable energy industries, while ocean-related mitigation efforts are also increasing and improving.

Prior to COP26 in 2021, a review of achievements and future needs identified that 45 of 118 countries included the conservation and restoration of coastal blue carbon ecosystems as mitigation components of their new or updated NDCs submitted as part of the first revision cycle. Five international initiatives on blue carbon, as well as the success of several regional and national conservation projects, are also highlighted.

Carbon dioxide emissions from international shipping account for between 2% and 2.5% of global anthropogenic emissions, despite being the most effective mode of mass transport. There is a new level of ambition in the international shipping and maritime industry relating to the uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources by 2030, with additional plans to reduce carbon intensity in the industry by 40% by 2030.

There is considerable theoretical potential to store captured and compressed CO2 in the sub-seabed of the ocean. A recent resolution regarding the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Protocol) removed barriers for countries who wish to make use of carbon capture and storage but lack ready access to offshore storage sites within their national boundaries.

Despite being a minor contributor to global carbon emissions, there are various decarbonization opportunities along the aquatic food value chain to contribute to the achievement of the 1.5 degrees Celsius climate goal. In the capture fisheries sector, opportunities include the use of renewable energy sources and improving the energy efficiency of operations, vessels and gear. In the aquaculture sector, there is significant potential to decarbonize aquaculture production and provide low-carbon, high-quality nutrition.

There is need of further research on the time scale of carbon capture and any additional impacts. It is crucial to diligently monitor the advancements in research findings arising from the dynamic debates within the scientific community to guide policy development.

240 IPCC. 2022. AR6 Climate Change 2022: Mitigation of Climate Change. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf

5. ADAPTATION

Section 5 focuses on adaptation measures, based on the following Roadmap recommendations: *Implement ecosystem-based adaptation (EbA) strategies through integrated coastal and ocean management institutions at national, regional, and local levels to reduce vulnerability of coastal/ocean ecosystems and of human settlements, and to build the management capacity, preparedness, resilience, and adaptive capacities of coastal and island communities.*

5.1 Actions within and outside of UNFCCC

2022 UN Environment Programme Adaptation Gap Report & other adaptation initiatives

Coastal and ocean examples of adaptation in the report included coastal flooding and tropical cyclones.[241] Infrastructural adaptation approaches in small island developing States (SIDS) were assessed as largely negative in their effectiveness, depending on rates of sea-level rise, type of infrastructure, and the existence of other interventions such as mangrove restoration and building codes. At higher levels of sea-level rise, sea walls eventually become unaffordable and impractical. The effectiveness of planned relocation of vulnerable populations in South and Southeast Asia were assessed as slightly negative or mixed, although generally insufficient evidence was available. The effectiveness of planned relocation depended on conditions under which relocation is undertaken (agency over decisions to move) and the destination conditions where people are being relocated. In most low-lying coastal areas, planned relocation is a last resort strategy due to a combination of hazards (e.g., cyclones, coastal flooding, soil salinization). At higher levels of warming, in some areas, planned relocation will be the only effective strategy but there is high uncertainty about when limits will be reached.

Shortly after the publication of the 2022 Adaptation Gap Report, the COP27 presidency announced the launch of the Sharm El-Sheikh Adaptation Agenda,[242] which outlines 30 adaptation outcomes that must be reached by 2030. Ocean and Coastal Systems constitutes one of five impact systems addressed, and each has 2030 Adaptation Outcome Targets built into the plan.[243]

The Agenda notes that global targets have not been defined in many areas (specifically coral reefs, temperate ecosystems, and urban coastline protection) to propel action towards systems resilience, and calls on all non-State and State actors to rally around these critical solutions for ocean and coastal resilience, to help define the need and the targets for these solutions, and to implement them at scale. There is also an Africa Spotlight which identifies a specific need for coastal and ocean outcomes that recognise local needs and varied ecosystems.

In September 2023, the Ocean and Climate Change Dialogue Report was released and addressed numerous examples of adaptation measures.[244] The co-facilitators identified two topics for this year's Dialogue and were hoping for discussions and exchanges around best practices to enhance ocean-based climate measures in nationally determined contributions (NDCs) and National Adaptation Plans (NAPs). The primary message for the coastal ecosystem restoration topic was to integrate mitigation and adaptation action for coastal ecosystems into policies and management practices at the national and regional levels (including into NDCs and NAPs) and improve the streamlining of national focus areas with other international conventions and agreements.[245]

Annex II in the Ocean and Climate Change Dialogue Report contains a valuable list of 105 best practices and case studies from a total of 252 that were submitted to the dialogue process.[246] The complete list is provided on the UNFCCC Ocean webpage.[247] As in previous Ocean and Climate Change Dialogues, visual summaries are used to convey the key outcomes of the report. The report also provides the visualisation of the good practices and messages to COP28 emerging from the discussion of the coastal ecosystem restoration topic. The report concludes with a number of key messages for COP28, and the results and recommendations of the Ocean and Climate Change Dialogue will be formally presented to the Parties at COP28 in Dubai.

The Directorate General for Maritime Affairs and Fisheries of the European Commission (DG MARE) and IOC-UNESCO decided to launch an "Updated Joint Roadmap to accelerate Marine/Maritime Spatial Planning processes worldwide"- marine spatial planning (MSP) roadmap (2022-2027), which will be implemented by the recently launched project MSP Global Initiative 2.0.[248]

The MSP roadmap (2022-2027) covers a set of six priority areas divided into cross-cutting and thematic pillars, in-

241 UNEP. 2022. Adaptation Gap Report. https://www.unep.org/resources/adaptation-gap-report-2022

242 COP 27. 2022. Sharm El-Sheikh Adaptation Agenda: The global transformations towards adaptive and resilient development, https://climatechampions.unfccc.int/wp-content/uploads/2022/11/SeS-Adaptation-Agenda_Complete-Report-COP27_FINAL-1.pdf

243 Ibid.

244 UN SBSTSA, 2023, Ocean and Climate Change Dialogue, Informal summary report by the co-facilitators of the Ocean and Climate Change Dialogue 2023-2024, UNFCCC Ocean Dialogue 2023 (download at https://unfccc.int/documents/631689)

245 Ibid. pp. 4-5.

246 Ibid. Annex II, pp. 30-34.

247 See https://unfccc.int/topics/ocean#Case-studies for the complete list.

248 IOC-UNESCO, European Commission. 2022. Updated Joint Roadmap to accelerate Marine/Maritime Spatial Planning processes worldwide. MSProadmap (2022-2027). https://www.mspglobal2030.org/wp-content/uploads/2022/11/MSProadmap2022-2027.pdf

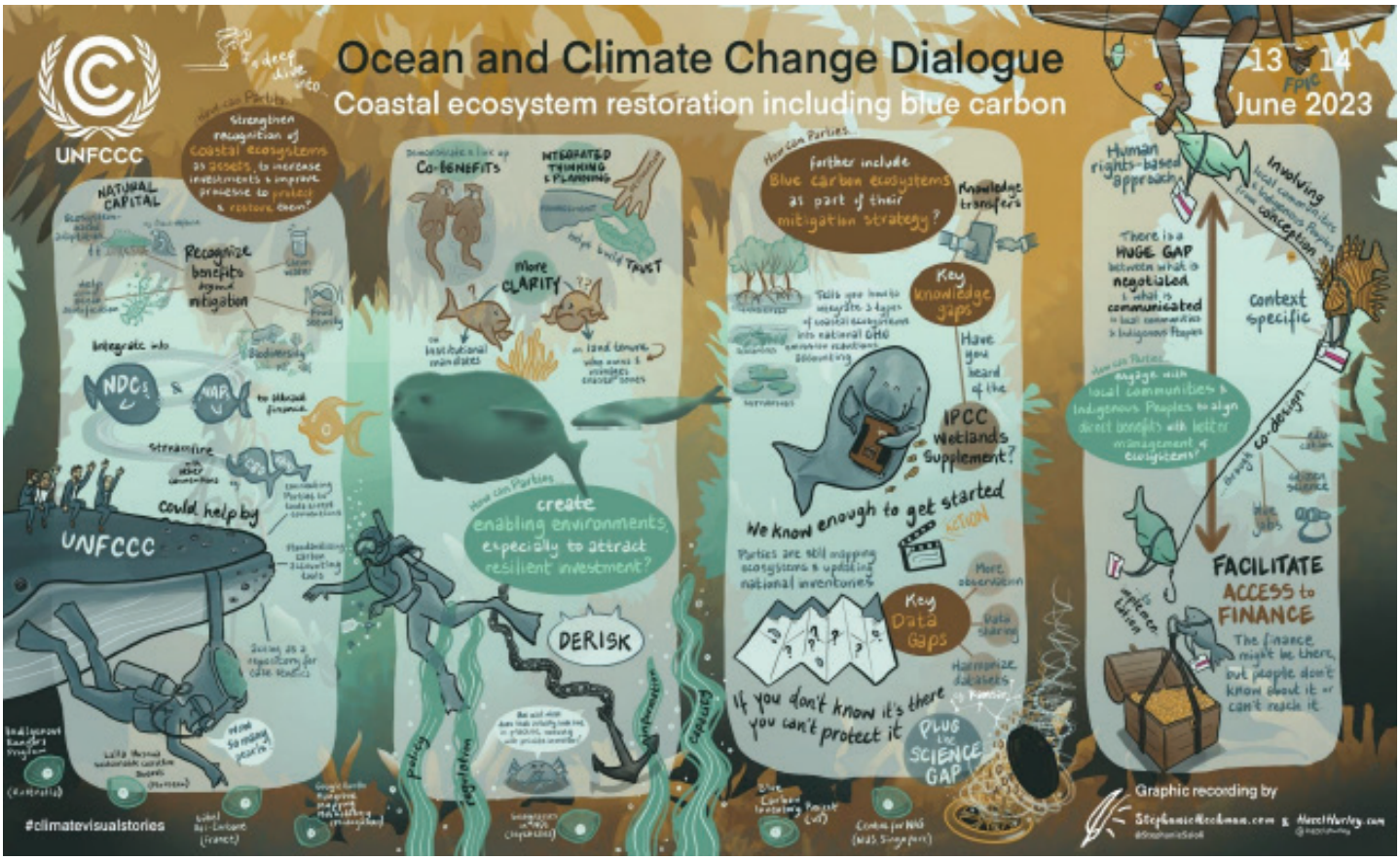

Figure 4. Ocean and Climate Change Dialogue: Coastal ecosystem restoration including blue carbon.

cluding one specifically focused on 'Climate-smart MSP'. Climate-smart marine spatial planning (MSP) refers to planning initiatives in the ocean space which integrate and may adapt to the effects of a changing climate. For MSP to become "climate-smart", data and knowledge on the pathways through which climate change impacts marine ecosystems and human uses are needed at appropriate spatial scales.[249] These should address the inherent uncertainties in planning scenarios themselves regarding climate change, particularly in relation to their ability to adapt to changing ocean conditions.

The adoption of climate-smart MSP is related to the integration of adaptation and mitigation measures into MSP to limit the global temperature increase to 1.5°C above pre-industrial levels as well as to build the resilience of marine ecosystems and reduce exposure and vulnerability of coastal communities and maritime activities to climate change impacts. This includes the identification and allocation of spaces for specific uses and ecosystem protection as well as designing adaptive planning processes that are flexible enough to incorporate emerging climate knowledge and actions. MSP can embrace and foster ocean-based solutions as NDCs such as the promotion of offshore renewable energy, the protection and restoration of blue carbon ecosystems, etc. Therefore, this priority area aims to promote and support the development of climate-smart MSP. Within the priority area on Climate-smart MSP the following actions are envisaged:

- Gauge the impact of climate change on activities in the marine environment and the maritime domain. The aim of this action is to promote and facilitate research and assessment on the impacts of climate change on some sectors of activity in, or related to, the marine environment and the maritime domain. The results and the findings of this research and assessment work will feed into the development of guidance on climate-smart MSP.
- Co-develop guidance about how to embark on a climate-smart MSP. This action aims to follow up on the MSP global work and develop specific international guidance on climate-smart MSP.

Adaptation Committee

The 2022 Report of the Adaptation Committee[250] focused on supporting the Parties to enhance adaptation action and support. The report includes a technical paper on methodologies for assessing adaptation needs and their application. This seeks to assist Parties by showcasing good practices that follow a five-step process for assessing adaptation needs. Notably, the publication is complimented by an interactive online tool to offer

249 Ibid.

250 UNFCCC AC. 2022. Report of the Adaptation Committee. FCCC/SB/2022/5. https://unfccc.int/documents/615114#:~:text=The%20report%20summarizes%20the%20Committee%27s,planning%2C%20implementation%20and%20reviewing%20of

support relating to NAPs. This tool can incorporate new programs and support opportunities more flexibly to respond to countries' information needs in a timelier manner. Recommendations from the Adaptation Committee (AC) for the COP27 included:

- Welcome the updated report on NAPs, including the complementary online tool, and invite Parties and non-Party stakeholders to make use of the information therein;
- Take note of the ongoing joint work of the AC with the Least Developed Countries Expert Group (LEG) on the process of formulating and implementing NAPs, including on gaps and needs identified by the AC and the LEG in the formulation and implementation of NAPs, and the contribution of the AC to the 2022 NAP Expo;
- Invite Parties and non-Party stakeholders to draw on the information contained in the AC technical paper on priorities and needs in technologies for adaptation in agriculture, water resources and coastal zones, and invite Parties and non-Party stakeholders to take note of the good practices, gaps and challenges identified therein; and
- Encourage further use of virtual and hybrid outreach platforms to improve the dissemination and use of AC knowledge products by organizations and practitioners inside and outside the UNFCCC processes.

2022 storm seasons: Setting the scene for adaptation needs

Globally, the world was rocked by major disasters in 2022, including 14 severe weather events, six floods, five droughts, three tropical cyclones, and one European windstorm.[251] A heat wave and drought in Europe resulted in USD $20 billion in damage in Europe and resulted in nearly 16,000 deaths. Monsoon flooding in Pakistan led to an estimated USD $5.6 billion in damages, making it the nation's second-most expensive weather disaster on record. Notably, the effects of this disaster were magnified by the vulnerability of the population, such as more people living in flood plains and lack of access to disaster resources. Human-caused climate change will only intensify these events, and vulnerable populations globally will face more severe, extreme displacement in the future.

Although an above-average hurricane season was forecasted in the Atlantic for 2022, ultimately the season was near-normal, breaking a six-year streak of above-normal seasons. However, the season was described by some climate scientists as an abnormal, normal hurricane season in the Atlantic due to the pacing of storms in the season. The majority of named storms occurred from September to November, marking the first time since 1941 that no named storms occurred between July and August.[252]

Despite the lower number of storms in the 2022 season, Hurricane Ian hit the Florida coast as one of the strongest hurricanes to ever make landfall in the US, causing devastating damage. Overall losses from 2022 storms amounted to the third-most expensive to date with Hurricane Ian causing over USD $20 billion in damages alone.[253] The most expensive hurricane season to date for insurers occurred in 2005, which stemmed from a series of extreme storms, including Hurricane Katrina. With Ian as the only notable storm in the 2022 season, this demonstrates the potential for singular, strong storms with extreme precipitation to cause severe impacts typically only accumulated by multiple storms of lesser magnitude. In October 2023, Hurricane Otis became the most powerful hurricane to hit the Pacific coast of Mexico and caused unprecedented damage to Acapulco as it rapidly transformed from a tropical storm to Category 5 hurricane withing a few hours. These "super storms" will occur more frequently and develop more quickly in the future due to climate change.[254]

European Green Deal

Following the adoption of the European Green Deal in 2021, the European Commission joined the European Climate Pact and pledged to make its operations climate neutral by 2030.[255] Another notable proposal adopted by the Commission in 2022 is the Nature Restoration Law, the first law of its kind explicitly targeting restoration in an effort to avoid ecosystem collapse and prevent the worst impacts of climate change and biodiversity loss.[256] This legislation included legally binding targets for nature restoration in different ecosystems that will apply to every member state with an aim to cover at least 20% of the European Union's land and sea areas by 2030 with nature restoration measures.

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251 Rauch, Ernst and Miesen, Peter. 2022. 2022 hurricane season: Fewer storms than anticipated, but still extremely damaging. UNDRR. Prevention Web. https://www.preventionweb.net/news/2022-hurricane-season-fewer-storms-anticipated-still-extremely-damaging

252 Feito, Melissa. 2022. 2022 Atlantic hurricane season ends, breaking the six-year streak of above-normal seasons. WUSF. NPR. https://www.wusf.org/weather/2022-11-30/2022-atlantic-hurricane-season-ends-breaking-the-six-year-streak-of-above-normal-seasons

253 Rauch, Ernst and Miesen, Peter. 2022. 2022 hurricane season: Fewer storms than anticipated, but still extremely damaging. UNDRR. Prevention Web. https://www.preventionweb.net/news/2022-hurricane-season-fewer-storms-anticipated-still-extremely-damaging

254 Buis, Alan. 2020. How Climate Change May Be Impacting Storms Over Earth's Tropical Oceans. NASA's Jet Propulsion Laboratory. Ask NASA Climate. https://climate.nasa.gov/explore/ask-nasa-climate/2956/how-climate-change-may-be-impacting-storms-over-earths-tropical-oceans/

255 European Commission. 2023. The European Green Deal. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en#:~:text=Climate%20change%20and%20environmental%20degradation,of%20greenhouse%20gases%20by%202050

256 See https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law_en for more information

Intergovernmental Panel on Climate Change Working Group II

Under the auspices of the 6th Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) Working Group II released a report in February 2022 entitled "Impacts, Adaptation and Vulnerability".[257] The report assesses the impacts of climate change by looking at ecosystems, biodiversity, and human communities at global and regional levels. A Summary for Policymakers provides a high-level summary of the key findings of the Working Group II Report. The report summary is broken down into four main sections, including 1) an overview of the objectives of the report and past working group contributions; 2) observed and projected impacts and risks of climate change; 3) adaptation measures and enabling conditions; and 4) climate resilience development. The key findings of the report include:

- Climate, ecosystems and biodiversity, and human societies are interdependent, and the report endeavors to integrate knowledge across natural, ecological, social and economic sciences;
- Human-induced climate change, including more frequent and intense extreme events, has caused widespread adverse impacts and related losses and damages to nature and people, pushing natural and human systems beyond their ability to adapt;
- Approximately 3.3 to 3.6 billion people live in areas that are highly vulnerable to climate change with vulnerability differing among and within regions;
- The magnitude and rate of climate change and associated risks depend strongly on near-term mitigation and adaptation actions, and projected adverse impacts and related losses and damages escalate with every increment of global warming;
- Financial, governance, institutional, and policy constraints serve as the primary roadblocks for human adaptation to climate change;
- Climate resilient development is facilitated by international cooperation and by governments at all levels working with communities, civil society, educational bodies, scientific and other institutions, media, investors and businesses; and by developing partnerships with traditionally marginalised groups, including women, youth, Indigenous Peoples, local communities and ethnic minorities; and
- Climate resilient development prospects are increasingly limited if current greenhouse gas emissions do not rapidly decline, especially if 1.5°C global warming is exceeded in the near-term.[258]

5.2 Adaptation responses in management of marine ecosystems, fisheries and aquaculture

Changing climatic conditions and global warming cause sea levels to rise in coastal cities around the world. In small island nations, which are low lying and thus highly vulnerable to rising sea levels, this act will result in "climate refugees." In response to this issue, there will be a need to build new or fortify existing regions that are suitable for potentially displaced people to live. This may require the migration of climate refugees to neighboring countries, creating trans-national complications. Governments, particularly in low-lying areas in small island states, are identifying innovative solutions with the help of donors, architects, engineers and others.

Maldives floating city: Adaptation to sea-level rise

The Republic of Maldives is an independent island nation in the Indian Ocean with a population of just over 500,000. The country consists of 1,200 small coral islands grouped in clusters of atolls. The economy is based on tourism, fishing, boat building and boat repairing, with tourism the main engine of growth. [259] Maldives is one of the world's most vulnerable nations to climate change, with 80 percent of its land area being less than one meter above sea level. With sea levels projected to rise by the end of the century, the entire country could potentially be submerged.

The government developed a public-private partnership with *Dutch Docklands* to provide a practical solution to adapt to climate change.[260] The aim was to develop a floating city which would be self-sufficient and have all the functions as those on land. The concept used a mix of green technology and ecological best practices to protect, preserve and enhance the pristine marine ecosystem.

The floating city is being built on a grid fixed to the seabed on telescopic steel stilts. Canals are the main infrastructure for logistics. No cars are allowed, and the only transport options include bicycles, electric buggies and scooters.[261] Electricity is powered predominantly by solar, and sewage is treated locally and repurposed as manure for plants. Instead of air conditioning, the city pumps cold water from the sea into the lagoon,

257 IPCC. 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844.

258 Ibid.

259 Encyclopedia Britannica. 2023. Maldives. https://www.britannica.com/place/Maldives

260 For more information on Dutch Docklands, access here: www.dutchdocklands.com

261 Maldives Floating City. 2021. https://maldivesfloatingcity.com

saving energy. The city has been designed in a pattern similar to brain coral and consists of 5,000 floating units including houses, restaurants, shops and schools among canals.[262] Under the city, blue habitats and an artificial reef have been created to encourage natural coral growth and attract other marine species. However, it has been noted that while research indicates that the floating city concept is dynamically and structurally feasible, further research is needed to ensure the safety and durability of the floating cities.

Seaweed farming in Zanzibar

Zanzibar is a semi-independent archipelago within the United Republic of Tanzania in East Africa. Tanzania was the largest exporter of seaweed for many decades and importantly, seaweed farming in Zanzibar is one of few options available for women to earn an income and serves as an important livelihood activity to alleviate poverty. Tanzania developed a Seaweed Development Strategic Plan in 2005 to expand growth of high-value seaweed species.[263]

Tanzanian farmers have observed a huge reduction in the volume of seaweed harvested since 2019, likely caused by rising in temperatures of nearshore waters. Of several species grown in Zanzibar, the highest mortality rate was observed in *Kappaphycus alvarezii*, (commercially known as Cottonii), which is the most valuable for export.[264]

Climatic variables including increased sea temperatures, increased winds and irregular rainfall all impact the ability of farmers to dry the seaweed before packaging it for export. The method of production prior to observable climate change impacts included tying fronds to ropes that were attached to wooden pegs driven into the sediment in the intertidal zone. After harvesting, the seaweed was washed to remove the salt and hung on ropes to dry. Bags of the dried seaweed were sold to a middleman who in turn sold them to a buyer to process into carrageenan, the base for many cosmetic products, including toothpaste, and many pharmaceutical products.[265]

In Pemba, the smaller of the two main islands in Zanzibar, a coping strategy for seaweed mortality in the intertidal zone has been to move their plots to deeper water to avoid exposure to increased temperature, moving the plots from place to place to see which area in deep water the seaweed thrived.

Launched after several trials across Zanzibar, a local nongovernmental organization called Zanzibar Cluster Initiative (ZaSCI) initiated a new technology to grow the fronds in tubular structures tied to mangroves on land. At high tide the tubes floated away to deep water. To harvest, the farmers only needed to pull the tubes to shore.[266] Other mitigation strategies were attempted, although many proved too expensive to be feasible.[267]

The current President of Zanzibar has recognized the importance of this industry and expressed a commitment to strengthen seaweed farming through Zanzibar's Blue Economy and Fisheries Strategy. This proposal highlights the need to build expertise in seaweed farming to add value and bring efficiency to farmers, of whom women form the majority. The new Ministry of Blue Economy and Fisheries is promoting seaweed farming and value addition and has initiated negotiations with the Government of Malaysia to establish a processing plant to manufacture Carrageenan.

Utilization of natural protected areas for adaptation in coastal and marine ecosystems

Ecosystems that are in natural Protected Areas (NPA) are better conserved and therefore have more capacity to adapt to the effects of climate change. These NPA are key for local organisms and the coastal communities that depend on them. NPA provide protection, refuge and food, as well as contributing to local productive activities and ensuring communities can maintain their cultural identity.[268] These areas and the nearby surrounding ecosystems perform important ecological functions, such as carbon sequestration, biomass generation, sea water filter, buffering of natural events and act as natural defense systems to a wide variety of stressors.[269]

The coastal and marine region is affected by countless climate change impacts, including increasing air temperature, altered water chemistry, shifting marine currents, trophic web interference and severe hydrological events.[270] These impacts create complex,

262 www.oceanservice.noaa.gov

263 Antoni, Marie-Louise. 2020. For seaweed farmers in Zanzibar, a chance for real growth. Global Seafood Alliance. www.globalseafood.org/advocate/for-seaweed-farmers-in-zanzibar-a-chance-for-real-growth/

264 de Jong Cleyndert, G., Newman, R., Brugere, C., Cuni-Sanchez, A., & Marchant, R. 2021. Adaptation of seaweed farmers in Zanzibar to the impacts of climate change. In African Handbook of Climate Change Adaptation (pp. 3-28). Cham: Springer International Publishing.

265 Note on "Carrageenan," the names differ depending on the regions where it is grown. In Zanzibar, it is called Cottonii. It is a carbohydrate extracted from seaweed used to thicken instant dairy products and milk beverages, ice cream mixes and processed cheese. It is also the base for several cosmetics including toothpaste and in the pharmaceutical industry. Blakemore, W. Harpell, Alan. 2009. "Carageenan" in Imeson, A. (Ed.). 2011. Food stabilisers, thickeners and gelling agents. John Wiley & Sons.

266 Msuya, F. E. 2021. The Zanzibar Seaweed Cluster Initiative: Fostering Seaweed Farming and Value Addition Innovation to Cope with Impact of Climate Change in Tanzania. In World Scientific Encyclopedia of Climate Change: Case Studies of Climate Risk, Action, and Opportunity Volume 2 (pp. 185-192)

267 Ibid.

268 Rivera-Arriaga Evelia, Azuz Adeath I, Peña-Puch A. 2023. Mitigación y adaptación al cambio climático. In: Rivera-Arriaga E, Azuz-Adeath I, editors. La Década del Océano en México 2021-2030: La Ciencia que Necesitamos. Primera. Campeche: RICOMAR, UAC. p. 279–308. https://epomex.uacam.mx/view/download?file=5415/Cap9.pdf&tipo=paginas

269 Rivera-Arriaga E, Escofet AM. 2019. Gobernanza socio-ambiental de las zonas costeras y marinas. In: Las Costas Mexicanas, Contaminación, Impacto Ambiental, Vulnerabilidad y Cambio Climático. p. 465–492; Peña-Puch A del C, Rivera-Arriaga E, Williams-Beck L. 2023. Exploring governance challenges in coastal communities through key informant perceptions in Campeche, Mexico. Ocean Coast. Manag. 242:106722. doi:10.1016/j.ocecoaman.2023.106722. https://linkinghub.elsevier.com/retrieve/pii/S0964569123002478.

270 Rivera-Arriaga Evelia, Azuz Adeath I, Peña-Puch A. 2023. Mitigación y adaptación

ecosystem-wide shifts resulting in sea-level rise and ocean acidification, among other processes. Shifting marine currents have the potential to impact nutrient distribution, thus altering recruitment, distribution and patterns of many species.[271] Coastal and marine biodiversity conservation is further challenged by the uncertainty of climate change effects.

NPA are essential for conserving and utilizing biological diversity. Long-term sustainability of these critical areas is more likely when they provide societal benefits, and when the value and appreciation of natural resources is part of the culture of the surrounding local communities. A paradigm shift is needed in the role, management and governance of NPA to ensure these areas can adapt to the environmental, political, social and economic challenges and pressures related to climate change.[272]

Climate change adaptation through aquatic food systems

According to the IPCC AR6, climate change will increasingly put pressure on food production from freshwater, coastal and open ocean marine ecosystems, especially in vulnerable countries and islands.[273] Aquatic food systems have the potential to provide critical climate change adaptation solutions. Notably, the 2023 UNFCCC Ocean and Climate Change Dialogue selected "fisheries and food security" as one of two topics for a deep-dive discussion.[274] To maximize this potential, the Food and Agriculture Organization of the UN (FAO) is supporting countries and communities to effectively mitigate and adapt to the impacts of climate change on aquatic food systems in accordance with the Blue Transformation roadmap,[275] as well as the FAO Strategy on Climate Change 2022–2031[276] and its Action Plan 2022–2025.[277] These include the provision of policy frameworks with solutions that can be tailored to the unique needs and circumstances of different regions and communities. Examples include: the FAO Adaptation Toolbox for fisheries and aquaculture,[278] guidelines on addressing fisheries and aquaculture in National Adaptation Plans (NAPs),[279] a compilation of good practice to climate proof the fisheries management cycle,[280] frameworks on identifying, sequencing and appraising adaptation options in the aquatic food sector[281] and guidance on the integration of human rights standards and laws into disaster risk reduction and climate action in small-scale fisheries.[282] Research and data gathering is underway on various topics including non-native species, improvement of climate impact models and nature-based solutions.

Based on these policy frameworks, FAO designs and implements field projects that put climate solutions into practice in many developing countries around the world, such as in Africa, the Caribbean, the Pacific SIDS and Southeast Asia.[283] Funding sources include the Global Environment Facility (GEF), Green Climate Fund (GCF) and bilateral funds such as those from Norway and Canada. For instance, in the Gambia, FAO is leading a GCF-funded project with a significant focus on fisheries: "Climate Resilient Fishery Initiative for Livelihood Improvement in the Gambia (PROREFISH)".[284] This project is set to climate-proof fisheries infrastructure, restore degraded mangrove areas and critical fisheries hotspots and protect livelihoods in coastal communities. Another example is a global project funded by Norway on "Responsible Use of Fisheries and Aquaculture Resources for Sustainable Development". The project works in Grenada, Lao PDR, Mozambique, Philippines, South Africa and Sri Lanka. Through this project, FAO assists partner countries and key stakeholders to adapt to climate change effectively while ensuring the socio-economic development of the aquatic food sector. Additionally, recognizing the indispensable role of climate finance in the implementation of adaptation and mitigation solutions in aquatic food systems, FAO has initiated work to support policymakers and stakeholders from the aquatic food sector to have better access to climate finance.

al cambio climático. In: Rivera-Arriaga E, Azuz-Adeath I, editors. La Década del Océano en México 2021-2030: La Ciencia que Necesitamos. Primera. Campeche: RICOMAR, UAC. p. 279–308. https://epomex.uacam.mx/view/download?file=5415/Cap9.pdf&tipo=paginas.

271 Ibid.

272 Bezaury-Creel J. 2010. Las Áreas Naturales Protegidas costeras y marina de México ante el cambio climático. In: Rivera-Arriaga E, Azuz-Adeath L, Alpuche-Gual L, Villalobos-Zapata G, editors. Cambio Climático en México: un enfoque costero y marino. Campeche: UAC-CETYS-Universidad-Gobierno del Estado de Campeche. p. 689–738.

273 IPCC. 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H. -O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press

274 UNFCCC. 2023. Ocean and climate change dialogue 2023. Informal summary report by the co-facilitators of the Ocean and Climate Change Dialogue 2023–2024. https://unfccc.int/sites/default/files/resource/Ocean%20dialogue_informal%20summary%20report_SB58_2023%20UNFCCC%20webpage%20publication%20%282%29.pdf

275 FAO. 2022. Blue Transformation - Roadmap 2022–2030: A vision for FAO's work on aquatic food systems. Rome. https://doi.org/10.4060/cc0459en

276 FAO. 2022. FAO Strategy on Climate Change 2022–2031. Rome. https://www.fao.org/3/cc2274en/cc2274en.pdf

277 FAO. 2023. FAO Action Plan 2022–2025 for the implementation of the FAO Strategy on Climate Change. Rome. https://doi.org/10.4060/cc7014en

278 Poulain, F., Himes-Cornell, A., and Shelton, C. 2018. Chapter 25 – Methods and tools for climate change adaptation in fisheries and aquaculture. In: Barange, M., Bahri, T., Beveridge, M.C.M., Cochrane, K.L., Funge-Smith, S. & Poulain, F. eds. 2018. Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options. FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO. 628 pp. https://www.fao.org/3/i9705en/i9705en.pdf

279 Brugere, C. and De Young, C. 2020. Addressing fisheries and aquaculture in National Adaptation Plans. Supplement to the UNFCCC NAP Technical Guidelines. Rome, FAO. http://www.fao.org/3/ca2215en/ca2215en.pdf

280 Bahri, T., Vasconcellos, M., Welch, D.J., Johnson, J., Perry, R.I., Ma, X. & Sharma, R., eds. 2021. Adaptive management of fisheries in response to climate change. FAO Fisheries and Aquaculture Technical Paper No. 667. Rome, FAO. https://doi.org/10.4060/cb3095en

281 Watkiss, P., Ventura, A., and Poulain, F. 2019. Decision-making and economics of adaptation to climate change in the fisheries and aquaculture sector. FAO Fisheries and Aquaculture Technical Paper No. 650. Rome, FAO. (also available at https://www.fao.org/3/ca7229en/CA7229EN.pdf)

282 Cook, K., Rosenbaum, K. L. and Poulain, F. 2021. Building resilience to climate change and disaster risks for small-scale fisheries communities. A human-rights-based approach to the implementation of Chapter 9 of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication. Rome, FAO. https://www.fao.org/3/cb7616en/cb7616en.pdf

283 See https://www.fao.org/fishery/en/climatechange

284 See https://www.greenclimate.fund/project/fp188

These include a series of studies on SIDS coastal areas, with the aim of generating climate data and information that could be useful to build the climate rationale of project proposals.

FAO is also collaborating with the international ocean community and actively contributes to international climate policy making to ensure that aquatic food systems are addressed within the UNFCCC and beyond. These efforts include participation in the UNFCCC Annual Ocean and Climate Change Dialogues, COPs and other related processes, such as the Marrakesh Partnership for Global Climate Action. Notably, the 2023 Dialogue emphasized the vital need to integrate the aquatic food sector into national processes and multilateral levels, such as the UNFCCC processes.[285] While the ocean has been a primary entry point for the aquatic food sector's engagement under the UNFCCC, it has become evident that this engagement must expand to encompass food production from freshwater systems and give due consideration to aquaculture.

5.3 Summary of achievements and future needs

The title of the 2022 UNEP Adaptation Gap Report says it all: "Too Little, Too Slow – Climate adaptation failure puts world at risk".[286] The report notes that current adaptation practice falls woefully short of what is required, in both nature and extent. Adaptation actions remain largely incremental in nature, typically do not address future risks from climate change, and may reinforce existing vulnerabilities or introduce new risks. This form of maladaptation poses risks for the most vulnerable populations by inadequately involving stakeholders, retrofitting development activities as adaptation, and not paying sufficient attention to local contexts and power dynamics.

As we look back on the past year, the message of UNEP's Executive Director, Inger Anderson, resonates even more that it did heading into COP27: "Climate change is landing blow after blow upon humanity and the planet, an onslaught that will only intensify in the coming years even if the world begins to bring down greenhouse gas emissions".[287] While progress was made on the number of countries establishing NAPs, the lack of financing for implementation and follow through was alarming, especially for developing countries. Without a major change in financing, the report predicted that adaptation actions would be outstripped by accelerating climate risks, further widening the adaptation implementation gap between developed and developing countries.

Data availability on the effectiveness and adequacy of adaptation is poor, especially for higher warming levels. However, hybrid solutions addressing multiple dimensions of climate-related risks and underlying structural inequities, such as gendered disadvantages, perverse incentives and the root causes of vulnerabilities, are typically more effective and supportive of climate-resilient development.

Governments, particularly in low-lying areas in small island states, are identifying innovative solutions with the help of donors, architects, engineers and others. Highlighted efforts include the design and construction of "floating cities" in the Maldives and support for the expansion of seaweed farming in Zanzibar. Finally, aquatic food systems have significant potential to provide critical climate change adaptation solutions. FAO is supporting countries and communities to maximize this potential and facilitate effective mitigation and adaptation to the impacts of climate change on aquatic food systems.

The reality is that the rapid pace of severe climate change impacts makes it increasingly difficult for traditional adaptation measures to provide effective solutions. As we move towards the world of 1.5oC, a paradigm shift is needed. Adaptation measures will need to seriously consider relocation and abandonment of high-risk coastal locations as climate change makes many areas uninhabitable and the cost of adequate protection becomes prohibitive.

285 UNFCCC. 2023. Ocean and climate change dialogue 2023. Informal summary report by the co-facilitators of the Ocean and Climate Change Dialogue 2023–2024. https://unfccc.int/sites/default/files/resource/Ocean%20dialogue_informal%20summary%20report_SB58_2023%20UNFCCC%20webpage%20publication%20%282%29.pdf

286 UNEP. 2022. Adaptation Gap Report. https://www.unep.org/resources/adaptation-gap-report-2022

287 Ibid.

6. LOW CARBON BLUE ECONOMY

6.1 International developments to advance blue economy practices

International focus on the blue economy has resulted in many countries and organizations making a significant effort to promote sustainable and responsible use of ocean and marine resources. Organizational and government investments in blue carbon initiatives focus on the conservation and restoration of coastal ecosystems like mangroves, seagrasses, and salt marshes. These ecosystems capture and store significant amounts of carbon, helping combat climate change.

The EU has developed a comprehensive strategy to harness the economic potential of its seas and oceans while ensuring environmental sustainability.[288] This strategy promotes sustainable fisheries, renewable energy from the sea, maritime tourism and marine biotechnology. It is one of many examples in which the blue economy is being progressively utilised for enabling the development and large-scale deployment of low-carbon technologies.

The Food and Agriculture Organization of the UN (FAO) launched the Blue Growth Initiative to promote sustainable practices in fisheries and aquaculture.[289] This initiative aims to ensure the long-term health of marine ecosystems while supporting the livelihoods of coastal communities. Furthermore, FAO is committed to Blue Transformation, a visionary strategy that aims to enhance the role of aquatic food systems in feeding the world's growing population by providing the legal, policy and technical frameworks required to sustainably sustain growth and innovation. Climate- and environment-friendly policies and practices, as well as technological innovations, are critical building blocks for Blue Transformation. The World Bank and the European Commission have jointly developed the Blue Economy Development Framework (BEDF) to provide guidance and funding for sustainable blue economy projects.[290] It emphasizes principles such as sustainability, inclusivity, and resilience in blue economy development.

In addition to these efforts, various organizations, including the World Bank and the UN, have continued to release reports and publications addressing low carbon blue economy practices. These reports often focus on topics such as marine conservation, renewable energy generation, sustainable fisheries management and ocean governance. Examples include progress reports from the World Bank's PROBLUE initiative, such as 'Global Seaweed New and Emerging Markets Report 2023',[291] the annual 'EU Blue Economy Report',[292] which provides updates on blue economy implementation, and several publications from the World Bank and the FAO Blue Growth Initiative.

The World Bank PROBLUE initiative[293] is an integral part of its blue economy program. Launched in 2018, it is a Multi-Donor Trust Fund supported by States and more recently, many private sector and philanthropic organizations have expressed interest in joining. It works in close collaboration with governments, development partners, UN agencies, academic and private sector experts and nongovernmental organizations. PROBLUE also supports capacity building in oceanic sectoral institutions. According to the 2022 PROBLUE Annual Report, the portfolio accounted for more than US$94.14 million in support of 143 activities in 80 countries. Cumulative disbursements at the end of fiscal year 2022 were more than $49.2 million, a notable increase from $30.5 million previously. All approved projects at the end of 2022 incorporate climate change and 92 percent include a gender component.[294]

Webinars and conferences have proven to be another important way in which knowledge and progress is shared internationally. From larger knowledge sharing initiatives such as the World Bank's 'Our Ocean Conference' to smaller scale webinars that explore the concept of the blue economy and provide practical examples of its implementation, these platforms will continue to be a valuable method to foster international efforts to create a low carbon future. The development of principles and funding mechanisms for blue economies is an ongoing process. International organizations, national governments, and financial institutions are working to establish guidelines and allocate funding to support sustainable low carbon blue economy projects.

6.2 Examples of work on a sustainable blue economy

There are several examples of blue economy developments that aim to lower carbon emissions at both national and regional scales. In this context, it is important to note the ongoing impacts of COVID-19 on

288 Access here for more information on the EU's new approach for a sustainable blue economy: https://oceans-and-fisheries.ec.europa.eu/ocean/blue-economy/sustainable-blue-economy_en

289 FAO. 2017. Blue Growth Initiative. https://www.fao.org/publications/card/fr/c/10d32cb5-a5bf-4905-936b-89bac8caab92/

290 See https://thedocs.worldbank.org/en/doc/e5c1bdb0384e732de3cef6fd2eac41e5-0320072021/original/BH023-BlueEconomy-FINAL-ENGLISH.pdf for more information

291 Further information at https://www.worldbank.org/en/topic/environment/publication/global-seaweed-new-and-emerging-markets-report-2023

292 Further information at https://op.europa.eu/en/publication-detail/-/publication/9a345396-f9e9-11ed-a05c-01aa75ed71a1/language-en/format-PDF/source-search

293 World Bank. 2023. PROBLUE. https://www.worldbank.org/en/programs/problue

294 World Bank. 2022. PROBUE 2022 ANNUAL REPORT. https://documents1.worldbank.org/curated/en/099446210212213910/pdf/IDU060636a660193c04f2508ed80ade2d52f46dd.pdf

the blue economy, which have been multifaceted, and include massive carbon emissions reductions. While the pandemic disrupted supply chains, reduced seafood demand and affected coastal tourism, it also underscored the importance of building resilience and sustainability into blue economy practices. Many nations and regions have recognized the need to prioritize environmental and economic sustainability in their recovery strategies, as the pandemic has exposed vulnerabilities in their dependency on certain blue economy sectors.

The ocean economy in the East Asian Seas (EAS) region was around US$1.5 trillion in value added in 2015.There are 61 million people directly employed in the ocean economy, however, more are dependent on the ocean for their livelihoods as small-scale, household, and informal activities are not included in the current accounts. The EAS region is home to a third of the world's mangrove forests, seagrass beds and coral reefs. These coastal and marine ecosystems, together with the tidal flats and salt marshes, are estimated to be worth around US$2 trillion. The blue carbon value is estimated to be US$68 billion for mangroves and US$40 billion for seagrass.

Bold and innovative actions are needed to protect ocean health, build more sustainable and resilient economies, reduce poverty and help the most vulnerable. Post-pandemic and gearing towards 2030, countries in the EAS region are transitioning towards a blue economy as an alternative development strategy anchored on sustainable and inclusive prosperity, low-carbon growth and protection of ocean ecosystems to ensure food security, jobs and livelihoods, resiliency, recreation, and wellbeing. The blue economy can help the region by:

- Creating nature-based jobs, such as aquaculture, ecotourism, restoration of coastal habitats, and managing protected areas;
- Offering new economic opportunities and jobs to reduce poverty through the sustainable development of key oceanic sectors;
- Helping the region to mitigate and adapt to climate change through blue carbon, offshore wind and ocean energy, decarbonization, and new technologies;
- Fostering nature-based infrastructure, such as mangroves, to provide protection from coastal erosion, flooding, storm surge, tsunami, and other natural disasters (as well as other ecosystem services);
- Improving fisheries by addressing the underlying causes of overfishing and IUU fishing, and addressing aquaculture sustainability, quality, and safety;
- Mitigating the threats to human and ocean health due to marine pollution through establishment of more wastewater treatment facilities with reuse applications, integrated solid waste management systems, and reuse of plastics and other recyclables;
- Advocating the inclusion of women, small-scale fishers, informal workers (such as those in the aquaculture, ports, shipping, tourism, trade and logistics industries);
- Advancing connectivity and trade through ports, shipping, submarine communications, and digitalization;
- Promoting science, innovation, and technologies to transform the ocean economic sectors to become sustainable, climate-smart, low-carbon, resilient, and more efficient and productive;
- Promoting sustainable ocean financing and new financing modalities to support climate action, biodiversity conservation, and blue economy development; and,
- Informing policymakers and stakeholders about the value of the ocean, and the need for bold actions now for the benefit of the future generations.

At the regional level, the EU has continued to implement its Blue Economy Strategy, which covers areas such as maritime transportation, sustainable fisheries, and marine research. Also at the regional level, countries in Southeast Asia have been working to enhance the resilience of coastal communities to climate change impacts. Initiatives include mangrove restoration, sustainable tourism, and disaster risk reduction. At the national level, the UK has been a leader in offshore wind energy development. It has continued to invest in expanding its offshore wind capacity, with ambitious targets for offshore wind installations. These projects contribute to the blue economy by creating jobs, reducing carbon emissions, and fostering innovation.

Innovative methods are being developed by many companies to meet the challenge, including floating offshore wind platforms and semi-submersible platforms.[295] America's first offshore wind farm, Block Island Wind Farm in Rhode Island, has 5 turbines producing 30 MW powering about 17,000 households. The Virginia Offshore Wind project currently has two turbines with plans to install 150 more. By 2026, these turbines will yield up to 2,600 MW of wind power capacity and provide electricity to upwards of 660,000 homes. These efforts are in line with President Biden's goals for promoting renewable energy, which include plans to deploy 30,000

295 The White House. 2023. "Fact Sheet: Biden-Harris Administration Advances Offshore Wind Transmission, Strengthens Regional Supply Chain Buildout and Drives Innovation". https://www.whitehouse.gov/briefing-room/statements-releases/2023/09/21/fact-sheet-biden-harris-administration-advances-offshore-wind-transmission-strengthens-regional-supply-chain-buildout-and-drives-innovation/

MW of offshore wind by 2030.[296] The DOE launched an Energy Earthshots in 2022[297] to reduce the cost of floating offshore wind in deep waters by 75% by 2035. These strategies aim to expand domestic offshore wind deployment, power millions of homes and businesses and create thousands of jobs.

The United States Environmental Protection Agency (EPA) launched a $7 billion grant competition in June of 2023 called "Solar for All".[298] Under the Inflation Reduction Act's Greenhouse Gas Reduction Fund, the goal of the competition is to expand the number of low-income and disadvantaged communities to invest in solar projects. The Fund will award up to 60 grants to states, territories, tribal governments, municipalities and eligible non-profits to create and expand low-income solar programs.[299]

6.3 Summary of achievements and future needs

There have been several notable achievements since 2021 in the low carbon blue economy sector. Many countries and organizations have accelerated efforts to reduce carbon emissions and promote sustainability in marine and coastal areas. These achievements include increased investments in offshore wind energy projects, the expansion of sustainable aquaculture practices and the establishment of new marine protected areas. The blue economy offers transformative opportunities for improving activities and sectors transitioning from evolving and emerging levels to prospective levels. Innovation and new technologies leverage new opportunities and increase the efficiency of existing practices. Examples include aquaculture/mariculture (especially seaweed farming), nature-based solutions to regenerate marine ecosystems and offer financial returns, offshore renewable energy, low carbon marine transport, blue-tech/blue biotech, and sustainable tourism.

Despite progress, significant challenges remain in advancing the low carbon blue economy. Key needs and action items for the future include:

- Work towards a universal understanding of how to assess the blue economy in differing contexts (at a national, subnational and large marine ecosystem level), including how to align ICOM and blue economy assessments;
- Encourage and ultimately establish better alignment between investor expectations with blue economy developers;
- Promote the inclusion of the blue economy within nationally determined contributions and the ability for countries to understand the valuation of natural capital;
- Seek greater investment into restorative / regenerative practices that will additionally generate economic outcomes;
- Enhance capacity building and training in blue economy assessment;
- Promote best practice based on proven track records of success;
- Adaptation of models that work into other geographies; and
- Develop well-structured investment prospects that align with investor expectations regarding risk, scale, sector and impacts, among other concerns.

296 Ibid.

297 US Department of Energy: Energy Earthshots Initiative. www.energy.gov

298 EPA. 2023. Biden-Harris Administration Launches $7 Billion Solar for All Grant Competition to Fund Residential Solar Programs that Lower Energy Costs for Families and Advance Environmental Justice Through Investing in America Agenda. News Release. https://www.epa.gov/newsreleases/biden-harris-administration-launches-7-billion-solar-all-grant-competition-fund#:~:text=WASHINGTON%20%28June%2028%2C%202023%29%20–%20Today%2C%20the%20U.S.,clean%20solar%20energy%20for%20millions%20of%20low-income%20households

299 Ibid.

7. POPULATION DISPLACEMENT

7.1 Status, current work and future projections

The adverse effects of climate change, disasters, and environmental degradation are increasingly reshaping human mobility patterns in both direct and indirect ways. For example, extreme events such as storm surges and cyclones, which are related to changes in the ocean, contribute to the displacement of millions of people globally. In 2022, there were 32.6 million new internal displacements worldwide, and approximately 98% of them were triggered by weather-related hazards such as floods, storms and droughts.[300] Migration and displacement triggered by slow-onset processes of climate and environmental change are more difficult to measure and, as a result, they are still largely unaccounted for. Similarly, processes such as sea-level rise, ocean acidification, loss and degradation of marine biodiversity and ecosystems, and loss of the ocean's regulatory services are linked to increasing human mobility. Coastal communities who depend on marine resources and ecosystems are becoming more vulnerable in the face of these many adverse effects. Many coastal and island nations have evidence of significant climatic impacts on fishing communities, affecting livelihood and productivity and increasing physical risks due to unpredictable weather patterns and storms.[301]

The challenges associated with these issues are likely to become more pronounced in the coming years, owing to several factors. First, according to the Intergovernmental Panel on Climate Change (IPCC), climate models forecast significant changes in the state of the ocean over the coming century. Under high emissions scenarios, potential impacts are expected to include, amongst other things, increased warming, ocean acidification, oxygen loss, decreased net primary productivity, reduced fish production and loss of key ecosystems services essential for human well-being and sustainable development.[302] Every region in the world is projected to face further increases in climate hazards, which will provoke multiple risks for ecosystems and humans in the near future. These issues are producing the conditions for increased human mobility, together with other socioeconomic factors such as the growth of urbanisation, a key driver of displacement risk. Second, as these challenges are


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becoming more prevalent, global responses are lagging, with risks currently outpacing resilience capacity. While some progress has been made in achieving conservation targets, such as those under the SDG 14 on life below water, overall action is not advancing at the speed or scale required to meet climate-related goals. Globally, there has been limited or no progress in conserving marine key biodiversity areas, and poor advances on ensuring sustainable fish stocks and reducing greenhouse gas emissions.[303]

Over the last decade, the relationship between climate change and migration has garnered increasing attention on the global policy agenda. The Global Compact for Safe, Orderly and Regular Migration includes principles and commitments to address the adverse impacts of climate and environmental change on human mobility. Progress to consider the migration perspective within the climate change negotiations under the UNFCCC is also notable.

In 2015, the Paris Climate Change Agreement mandated the creation of the UNFCCC Task Force on Displacement within the Warsaw International Mechanism on Loss and Damage, an expert body that developed recommendations on addressing displacement caused by climate

300 IDMC. 2023. Global Report on Internal Displacement. https://www.internal-displacement.org/global-report/grid2023/

301 See framing-the-human-narrative-of-migration-in-the-context-of-climate-change_0.pdf (iom.int)

302 IPCC. 2019. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 755 pp. https://doi.org/10.1017/9781009157964

303 United Nations. 2023. Global Sustainable Development Report. https://sdgs.un.org/sites/default/files/2023-09/FINAL%20GSDR%202023-Digital%20-110923_1.pdf

change. More recently, at the COP27, the importance of addressing migrants' human rights and the impacts of climate change on human mobility was highlighted in the Sharm el-Sheikh Implementation Plan.

However, while these advances are commendable, further efforts are needed to better integrate human mobility into relevant multilateral processes and translate global policy principles and commitments into tangible on-ground actions. In the context of the ocean, the 2022 Oceans Conference addressed many issues relevant to human mobility, such as the need to reduce vulnerability to climate change impacts and support sustainable livelihoods, and the importance of developing multi-hazard early warning systems and integrating ecosystems-based approaches for disaster risk reduction at all levels and across all phases. Its outcomes did not specifically incorporate human mobility or a people-centred approach to addressing the broader social impacts of climate change on oceans.

Under the UNFCCC processes, further actions can be taken to integrate human mobility across several workstreams. For example:

- Strengthen climate change adaptation including efforts to enable safe, empowered, and informed decisions on human mobility by individuals, communities, and governments specifically:
    - When and where it is still possible, further strengthen people's resilience through prevention, preparedness and risk reduction measures to enhance sustainable development and offer people the choice to stay in dignity and safety in their areas of origin; and
    - Allow people to move out of harm's way when faced with irreversible climate impacts.
- Include human mobility within loss and damage plans and policies to address the impacts of both slow-onset processes and sudden-onset hazards. This will strengthen planning processes and integrated approaches to disaster risk reduction, preparedness, humanitarian assistance, and development. It is crucial to treat displacement as a form of loss and damage associated with climate change in current and new funding and financing strategies. Financial sources and mechanisms should:
    - Support prevention and risk reduction measures for climate change-induced displacement, both internal and cross-border;
    - Enhance protection, assistance and social protection; and
    - Focus on durable solutions and governance to manage displacement.

7.2 Summary of achievements and future needs

Over the last decade, the relationship between climate change and migration has garnered increasing attention on the global policy agenda. The Global Compact for Safe, Orderly and Regular Migration includes principles and commitments to address the adverse impacts of climate and environmental change on human mobility. Progress to consider the migration perspective within the climate change negotiations under the UNFCCC is also notable. The importance of addressing migrants' human rights and the impacts of climate change on human mobility was highlighted in the Sharm el-Sheikh Implementation Plan. Further efforts are needed to better integrate human mobility into relevant multilateral processes and translate global policy principles and commitments into tangible on-ground actions. Moving forward, actions must include the following considerations:

- Specifically incorporate human mobility or a people-centred approach to addressing the broader social impacts of climate change on oceans;
- Strengthen climate change adaptation including efforts to enable safe, empowered, and informed decisions on human mobility by individuals, communities, and governments specifically;
    - Include human mobility within loss and damage plans and policies to address the impacts of both slow-onset processes and sudden-onset hazards; and
    - Treat displacement as a form of loss and damage associated with climate change in current and new funding and financing strategies.

8. FINANCING ON THE OCEAN AND CLIMATE

8.1 Financing on the ocean and climate

Finance is a key component to the development of a sustainable and regenerative blue economy that delivers on ocean and climate.[304] There has been a marked increase in public and private finance to deliver ocean-climate mitigation solutions. Larger ocean sectors have access to commercial finance and the capital markets to fund the required transition, to be supported by appropriate regulatory frameworks. Direct finance for mature ocean climate solutions, such as offshore wind, is available at scale and on commercial terms. Here, the finance emphasis needs to be on supporting value chains, training and on delivery to the widest possible range of countries.[305] The recent Ocean Panel report suggests that at least US$1 trillion of additional finance is needed between now and 2030 to facilitate a rapid transition to achieve ocean-climate solutions.[306]

Delivery of Target 19 of the new Global Biodiversity Framework (GBF) requires increased investments in coastal nature-based solution (NbS) projects, (e.g., in project development, regulatory approvals, financial management, project implementation, research and development). This includes impact funds and other instruments, as well as increased investment in conservation and restoration of blue carbon ecosystems through innovative finance, carbon pricing mechanisms, and public-private partnerships.[307] The State of Finance for Nature 2021 report[308] puts the cost of mangrove restoration finance alone at a total of $15 billion for the period from 2021 to 2050, of which $4 billion invested by 2030 is the target of the mangrove Breakthrough.[309] Investments in other NbS projects, such as seagrass or salt marsh restoration, will require similar financing commitments.

The World Bank funded $31.7 billion in 2022 to finance innovative climate solutions. Its Climate Investment Financing (CIF) comprises two funds: the Clean Technology Fund; and the Strategic Climate Fund. The Clean Technology Fund enables clean energy transformation in developing countries while the Strategic Climate Fund provides financing to pilot innovative approaches or to scale up activities aimed at specific climate change challenges of sectoral responses.[310] The funds aim to create partnerships and develop new financial instruments for low carbon, climate-resilient development, support member countries to help lower the cost of capital and dismantle barriers to implement initiatives and catalyze private capital and scale-up climate action.[311]

World Bank's member countries prepare and disseminate "Country Climate and Development Reports" which integrate climate change and development considerations. The goal of the reports is to assist governments, private investors, development partners and people to prioritize actions to reduce GHG emissions and promote distribution through regional development banks. While many countries have been successful in accessing funds from these banks, those with limited capacity may not be aware of the availability of such funds. In addition, they may not have developed Climate Change Mitigation Strategies, Climate Action Plans or Country Climate Development Reports or have the capability to prioritize climate issues and develop proposals. Targeted capacity building and technical assistance are critical to assist these countries to develop such strategies, action plans and develop proposals to access financing.

8.2 Innovative sources of ocean financing

Innovative finance mechanisms, including blended finance approaches to a sustainable blue economy, will be key. This will require increased engagement of public finance institutions to facilitate cash flows based on blue finance guidelines.[312] Carbon markets are increasingly being considered as financing mechanisms for NbS such as blue carbon. Large, efficient finance sources such as capital markets can be engaged through the issuance of instruments such as blue bonds to provide investment opportunities for large-scale long-term investors such as pension funds and other asset owners.[313]

However, finance for ocean-based food needs to be re-aligned to fully integrate both climate and nature considerations into funding decisions. Targeted funding for regenerative aquaculture, including seaweeds and

304 Sumaila, U.R., M. Walsh, K. Hoareau, A. Cox, L. Teh, P. Abdallah, W. Akpalu, et al. 2021. "Financing a Sustainable Ocean Economy." Nature Communications 12 (1): 3259. https://doi.org/10.1038/s41467-021-23168-y.

305 Hoegh-Guldberg, O., Northrop, E. et al. 2023. "The ocean as a solution to climate change: Updated opportunities for action." Special Report. Washington, DC: World Resources Institute. Available online at https://oceanpanel.org/publication/ocean-solutions-to-climate-change

306 Ibid.

307 See https://www.cbd.int/gbf/targets/

308 UNEP. 2021. State of Finance for Nature: Tripling Investment in Nature-Based Solutions by 2030. Nairobi: UNEP. https://www.unep.org/resources/state-finance-nature-2021

309 Climate Champions. 2022. "Mangrove Breakthrough." https://climatechampions.unfccc.int/the-man- grove-breakthrough/

310 World Bank. 2019. Climate Finance and Initiatives. https://www.worldbank.org/en/topic/climatechange/brief/world-bank-carbon-funds-facilities

311 World Bank Group. 2022. Climate and Development: An Agenda for Action - Emerging Insights from World Bank Group 2021-22 Country Climate and Development Reports. © Washington, DC: World Bank. http://hdl.handle.net/10986/38220 License: CC BY-NC-ND.

312 International Finance Corporation. 2022. Guidelines Blue Finance: Guidance for Financing the Blue Economy, Building on the Green Bond Principles and the Green Loan Principles. Washington, DC: IFC. https:// www.ifc.org/content/dam/ifc/doc/mgrt/ifc-guidelines- for-blue-finance.pdf.

313 Schindler Murray, L., B. Milligan, O.S. Ashford, E. Bonotto, M. Cifuentes-Jara, L. Glass, J. Howard, et al. 2023. The Blue Carbon Handbook: Blue Carbon as a Nature-Based Solution for Climate Action and Sustainable Development. Washington, DC: High Level Panel for a Sustainable Ocean Economy. https://oceanpanel.org/ publication/blue-carbon/.

invertebrates, and mariculture can contribute to ecosystem restoration and climate mitigation. Investment on the order of $55 billion total will likely be needed between now and 2050.[314] The SDG 14 funding gap remains a consistent challenge to scaling ocean conservation solutions. A growing number of pathways have emerged with an aim of increasing financial flows from all sources. Innovative financial instruments are being deployed including blue bonds, coral reef insurance, and blended finance vehicles.

The Global Fund for Coral Reefs (GFCR) became operational in 2021 as a blended finance vehicle and hosts the only UN fund dedicated to SDG 14, as well as a privately managed impact investment fund. Through an ecosystem-based approach, the GFCR deploys grant, concessional and investment capital to scale financial solutions that aim to bolster the resilience of coral reefs and the communities that depend on them. Early lessons learned from the GFCR and other actors in the SDG 14 finance space include the need for prioritized action and catalytic use of Official Development Assistance (ODA) to identify, incubate and de-risk pipelines of bankable solutions aligned with ocean-positive impact. Although in early stages of portfolio growth, the GFCR has already identified and begun incubation support for more than 30 coral reef-positive enterprises through blended finance programming in ten countries, including SIDS and least developed countries (LDC). GFCR is now working to scale that approach to 23 countries by the end of 2024, with a target of incubation support and unlocked private investment to scale impact for over 200 solutions by 2030.

A coalition of 45 nations has recently announced a pledge to raise $12 billion to help protect and preserve coral reefs around the world. The International Coral Reef Initiative, a government and NGO coalition founded in the 1990s, and partners such as the GFCR have launched a multi-part plan to save 50,000 square miles of tropical coral reefs around the planet. The "Coral Reef Breakthrough" calls for four major actions: 1) doubling the area of coral under effective protection; 2) raising $12 billion for conservation; 3) speeding up coral restoration and climate adaptation for 30% of degraded reefs by 2030; and 4) stopping drivers of coral loss, like land-based pollution, destructive development and overfishing. In a call to action, partners declared that "the target of USD 12 billion by 2030 illustrates that radical commitments are necessary given the dire state of coral reef health worldwide, and ocean conservation at large is chronically underfunded".[315]

314 Elwin, P., E. Amadi, E., Mitchell E., and P. Hunter P. 2023. "Financial Markets Roadmap for Transforming the Global Food System." London: Planet Tracker. https:// planet-tracker.org/wp-content/uploads/2023/03/Fi- nancial-Markets-Roadmap-Executive-Summary.pdf.

315 The Maritime Executive. 2023. Coalition of Nations Call for $12B Plan to Save Planet's Coral Reefs. https://www.coastalnewstoday.com/post/world-coalition-of-nations-call-for-12b-plan-to-save-planets-coral-reefs

8.3 Summary of achievements and future needs

There has been a marked increase in public and private finance to deliver ocean-climate mitigation solutions. The European Commission, through its BlueInvest initiative,[316] already supports an emerging group of blue impact funds. These efforts provide funding for early-stage ocean businesses, although an overall investment of at least $2 trillion from 2030 to 2050 will be required to reach scale across the ocean sectors.[317]

However, finance needs to be further aligned to fully integrate both climate and nature considerations into funding decisions, with targeted funding for offshore wind, regenerative aquaculture, including seaweeds and invertebrates, and mariculture, among other things, that can contribute to ecosystem restoration and climate mitigation.

The global offshore wind market grew by 8.8 GW in 2022, attracting US$31 billion in investments, and is expected to add 35.5 GW by 2027.[318] Growing investment is expected to make offshore wind energy the leading ocean-climate mitigation solution by 2030.[319] Additional investment on the order of $55 billion total will likely be needed between now and 2050 to achieve ocean-climate goals.[320]

Multilateral Development Banks (MDBs), development finance institutions (DFIs), and private financial institutions will need to better integrate adaptation and resilience impact into their investment portfolios and scale up their ambition for future investment. Early lessons learned from the GFCR and other actors in the SDG 14 finance space include the need for prioritized action and catalytic use of Official Development Assistance (ODA) to identify, incubate and de-risk pipelines of bankable solutions aligned with ocean-positive impact.

316 See https://maritime-forum.ec.europa.eu/theme/investments/blueinvest_en

317 Stanley, Morgan. 2023. "4 Ways to Invest in a Sustainable 'Blue Economy.'"https://www.morganstanley. com/ideas/blue-economy-investing-ocean-priorities.

318 GWEC (Global Wind Energy Council). 2023. Global Wind Report 2023. Brussels: GWEC. https://gwec.net/global- windreport2023/

319 IRENA. 2023. World Energy Transitions Outlook: 1.5°C Pathway. Abu Dhabi: IRENA. https://www.irena.org/

320 Elwin, P., E. Amadi, E., Mitchell E., and P. Hunter P. 2023. "Financial Markets Roadmap for Transforming the Global Food System." London: Planet Tracker. https:// planet-tracker.org/wp-content/uploads/2023/03/Fi- nancial-Markets-Roadmap-Executive-Summary.pdf.

9. CAPACITY DEVELOPMENT

9.1 Building capacity for the ocean in a changing climate: Updates 2022-2023

Ocean literacy is essential for achieving global commitments to sustainable development by 2030 and beyond, particularly in historically neglected communities that tend to be on the front lines of environmental collapse. Impactful, positive change can only come with ocean knowledge that is widely and equitably accessible and has personal relevance and connection. The International Ocean Institute (IOI) has trained young practitioners in Ocean Governance for more than 50 years and has now added the IOI Ocean Academy programme to extend ocean literacy to wider audiences.[321] The global IOI Ocean Academy, launched online in 2021, is an impactful programme teaching the essential principles of Ocean Literacy, meeting such needs cross-generationally using culturally relevant and broad local curricula.

An IOI Ocean Academy Course is designed to provide regionally and locally relevant ocean information delivered in local languages by local experts affiliated with the IOI. On completing the module, an IOI Ocean Academy Course participant will gain a basic understanding of the ocean; learn about the importance of ocean governance, sustainable and equitable human use, the principle of the common heritage of humankind, respecting the needs of future generations, all in locally relevant context; and be empowered to become more active locally as stakeholders to positively influence their communities and beyond. So far, IOI Ocean Academy courses have been delivered in 19 countries, in 17 languages, reaching thousands in local communities worldwide. This global expansion reflects the programme's commitment to reaching diverse audiences worldwide. Partnerships and courses in countries such as India, Sri Lanka, Kazakhstan, Maldives, Pakistan, Portugal, Singapore, Turkey and Ukraine underscore its global reach, facilitating the delivery of locally relevant ocean knowledge to a wide range of communities. Crucially, the IOI Ocean Academy has succeeded in providing locally relevant information through local experts and in local languages, which has enriched the learning experience. The IOI Ocean Academy's ability to adapt and refine its model based on ongoing experience has been crucial to its success, while the IOI Ocean Academy's commitment to providing free access to ocean knowledge has been pivotal in reaching diverse audiences.

Overall, the IOI Ocean Academy aligns with UN Agenda 2030 and SDG 14. The program has the potential to achieve significant impact in enhancing sustainable use of the Ocean and protecting the environment in coastal communities where the need is greatest. Its future needs revolve around sustaining this success through financial support, expanding partnerships, enhancing administrative capacity, measuring impact, and maintaining adaptability.

9.2 Building ocean science capacity for climate action

The Intergovernmental Oceanographic Commission Capacity Development Strategy 2023-2030

Following a series of reviews by the Intergovernmental Oceanographic Commission (IOC) Group of Experts on Capacity Development (GE-CD) and consultations with other international organizations, the IOC Capacity Development Strategy 2023-2030 was developed and adopted by the 32nd Assembly of the IOC-UNESCO in June 2023. Despite increased prominence of the ocean in recent years, the full impact of climate change on the marine environment is still to be realised. As capacity development is an essential tenet of IOC's mission to enable all Member States to participate in and benefit from ocean research and services, the IOC Capacity Development Strategic framework provides general guidance on elements of an implementation plan such that the IOC CD outputs, activities and actions are clearly articulated and that the benefits are more readily identified.

The updated strategy addresses many competing challenges such as climate change, biodiversity, and habitat loss and their impacts on marine resources, services, observation systems, etc. While maintaining the original six outputs from the 2015-2021 edition of the IOC Capacity Development Strategy, the revised strategic framework has now more substantive actions which were identified through the outcomes of various needs assessments and consultations. It also incorporated important priorities such as data sharing, gender equality, SIDS, indigenous communities, basic education, ocean literacy and early career professionals among others.

Further as a response to a request from IOC Member States to develop a global database that can give equitable and easy access to existing capacity development opportunities related to ocean science, the IOC developed and launched the IOC Ocean CD-Hub,[322] an online search engine which helps individuals and organizations search for capacity development opportunities offered around the world.

321 See https://www.ioinst.org/ioi-ocean-academy-1/

322 See https://oceancd.org

Considering the IOC Criteria and Guidelines on the Transfer of Marine Technology, the IOC CD-Hub enables Member States to access information on capacity development opportunities for ocean science related training, research, data sharing, information, jobs, grants, materials, and sources of data and information technology. This tool helps to facilitate the matching of the needs identified through the needs assessment surveys and consultations to the existing resources and expertise, as well as facilitating collaborations and partnerships with other organizations providing capacity development activities including governmental, academic, private sector, non-governmental and intergovernmental organizations (IGO). Given the value and relevance of the Ocean CD-Hub initiative the IOC was able to demonstrate its usefulness to other ocean governance frameworks, for example, at the negotiations for a new High Seas Treaty, which now refers to the IOC as an organisation to cooperate with in support of a BBNJ clearing house mechanism.

Elevating IOC's impact to the required scale while also aligning with the existing CD efforts and initiatives of national, regional and international organizations, the IOC Capacity Development programmes have taken into account more of what's required to address existing capacity gaps not only to support IOC's capacity development ambitions, but also the targeted outcomes of other global frameworks, such as the UN Decade of Ocean Science for Sustainable Development.

UN Decade of Ocean Science for Sustainable Development 2021-2030

The ocean-climate nexus is one of the ten Ocean Decade Challenges, and climate change mitigation and adaptation considerations are cross-cutting across the majority of the remaining nine Challenges. A series of cross-cutting programmes actively work with thematic and regional programmes to develop capacity, ensure inclusivity and diversity, and support co-design of future Decade Actions. Capacity development is a tenet of the Ocean Decade and serves as an underlying theme and requirement for all 10 Decade Challenges; significantly, Challenge 9 ("Skills, knowledge and technology for all"), which specifically refers to capacity development.[323] All initiatives that are submitted for endorsement as Decade Actions, no matter which Challenge they focus on, must demonstrate how they contribute to capacity development, with particular emphasis on small island developing States (SIDS), least developed countries (LDCs), and landlocked developing countries (LLDCs).

To achieve the Ocean Decade's transformative vision of supporting the generation and use of ocean science for sustainable development, it is important that all actors, regardless of geography, gender or generation, are able to actively participate and benefit. Fostering and strengthening the necessary skills and expertise for the co-design, co-delivery and uptake of ocean knowledge in decision making and policy are key.

Furthermore, the newly established Ocean Decade Capacity Development Facility (herein the Facility) will build on the long-standing experience of UNESCO's Intergovernmental Oceanographic Commission in capacity development. It will support actors wishing to engage in the co-design of future Decade Actions, as well as the existing Decade Actions who may require further support on targeted capacity development initiatives. The Facility will integrate specific activities to mobilize resources and establish partnerships with philanthropic partners, governments and industry to secure financial and in-kind contributions to operational costs and thus ensure its sustainability throughout the Ocean Decade and beyond. The ocean-climate nexus has been identified as one of the top priority areas along with marine biodiversity and sustainable ocean planning for the Capacity Development Facility.

The Ocean Decade Alliance is a group of global Decade champions from government, philanthropy, industry and UN agencies (herein the Alliance).[324] The Alliance is mandated to catalyze mobilisation of resources to achieve the vision of the Ocean Decade. Alliance partners commit to provide significant financial or in-kind resources work with their networks to leverage and multiply resource commitments from their peers and advise the IOC-UNESCO on resource mobilization strategies to enhance funding for Decade priorities. In the margins of the SDG Summit 2023 taking place on 18-19 September, the SIDS Coalition for Nature[325] and the Ocean Decade Alliance have launched a Statement of Collaboration and Joint Action Framework to harness opportunities for accelerated action in SIDS through ocean knowledge, outreach and capacity development.

The Early Career Ocean Professional (ECOP) programme, supported by IOC-UNESCO, works closely with other endorsed Decade programmes to ensure a generational exchange of knowledge and provides support to early career ocean professionals. These individuals will be pivotal to the success of the Decade as they navigate their careers over the next ten years.[326] Through providing funded opportunities, training workshops, and

323 The Ocean Decade. 2023. The science we need for the ocean we want. https://oceandecade.org/

324 See https://oceandecade.org/ocean-decade-alliance/ for more information on the Alliance.

325 For more information, see: https://sidscoalitionfornature.org/

326 For more information, see: https://www.ecopdecade.org/

elevating the voices of ECOPs, the programme fosters collaboration across geographies, disciplines and sectors.

9.3 Empowering civil society and the youth

Young people are the leaders of the future and must be prepared and empowered to cope with the impacts of climate, biodiversity and ocean change that they will inherit from today's leaders.

Adults can champion young people as environmental leaders, amplify indigenous and traditional knowledge, and support and enable peer-to -peer and intergenerational mentoring and learning. Active, dialogue-based science learning and empowered civic action can help to combat science anxiety through interactive learning opportunities that equip young people with nuanced understandings of climate and ocean science alongside

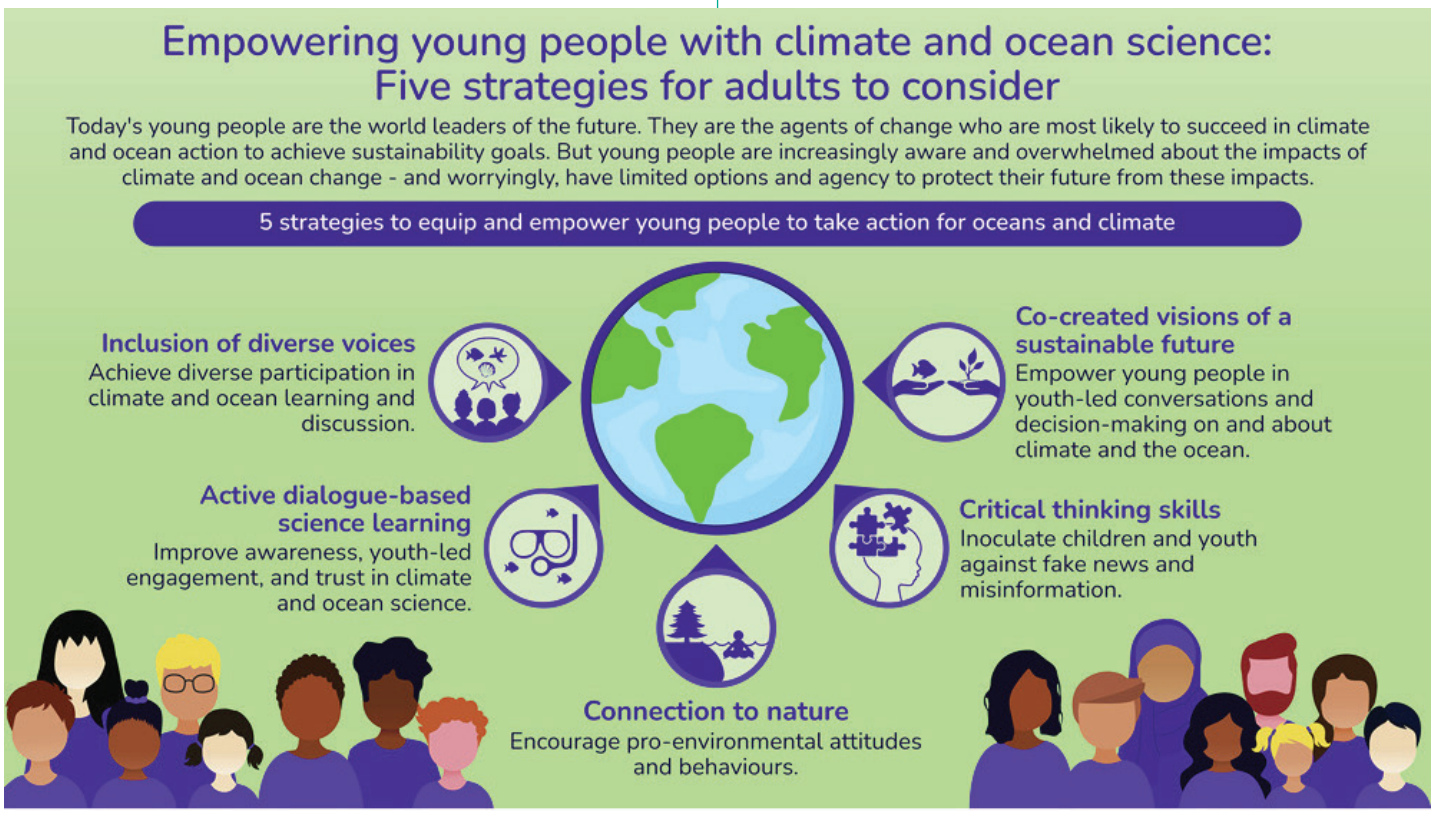

Figure 5. Empowering young people with climate and ocean science: five strategies for adults to consider. Source: Kelly, R., Elsler, L. G., Polejack, A., van der Linden, S., Tönnesson, K., Schoedinger, S. E., ... & Wisz, M. S. 2022.

Unfortunately, few young people have opportunities to adequately prepare for that future.

Young people today are challenged by misinformation and disinformation, limited agency, social injustice, climate anxiety and nature disconnectedness. Conventional science education and communication alone, if available, is not enough to help young people to meet these challenges, nor does this bestow leadership skills.

A recent report identified five actionable strategies to engage and empower young people with climate and ocean science in support of long-term sustainability: 1) inclusion of diverse voices, 2) active dialogue-based science learning, 3) connection to nature, 4) critical thinking skills, and 5) co-created visions of a sustainable future.[327] Together, the strategies can synergistically empower young people to have a say in shaping their sustainable future.

strategies for constructive ways to cope. Engaging young people in nature experiences that appeal to all senses and supporting their role as environmental stewards helps to build compassion for nature and establish pro-environmental behaviors that will shape their actions in the future. Inoculating young people against fake news through the development of critical media literacy helps to strengthen young people's capacity for empowerment. Likewise, supporting and championing youth-led environmental networks helps to give young people skills, voice and agency to shape their future and to be actors for change.

Efforts to provide training opportunities for youth are growing in popularity at the national level. In September 2023, the White House announced the launch of the American Climate Corps (ACC), a new US federal program with plans to train 20,000 young Americans in technical skills needed for the climate tech marketplace.[328] The targeted skillset will focus on preparation

327 Kelly, R., Elsler, L. G., Polejack, A., van der Linden, S., Tönnesson, K., Schoedinger, S. E., ... & Wisz, M. S. 2022. Empowering young people with climate and ocean science: Five strategies for adults to consider. One Earth, 5(8), 861-874. https://doi.org/10.1016/j.oneear.2022.07.007

328 Garden, Leah. 2023. American climate corps: what we know so far. GreenBiz

for jobs centering on low-carbon energy and climate resilience. While many details of the American Climate Corps are still unknown, federally-supported career training such as the ACC, in tandem with legislation, could be instrumental in fostering the careers of next-gen climate experts and producing climate-ready solutions.

Globally, young people are engaging with climate, biodiversity, marine science and policy in a way that previous generations have not. Without action, their futures will be dominated by heatwaves, storms, floods and other consequences of global warming. As world leaders and other stakeholders assemble annually for the Conferences of the Parties to the UNFCCC, science-led youth movements and an emerging generation of young ocean-climate scientists and advocates want to take an active part in global climate and ocean efforts. In the past few years, young people have denounced and refused to accept a tokenistic approach in participatory processes that promote systemic change in addressing climate and ocean challenges. Beyond aiming to be at the forefront of decisions that are crucial for their future, youth movements aspire to be the bearers of innovative solutions to address complex, multifaceted crises affecting the ocean and climate. Moreover, the concept of climate and environmental justice has permeated youth demands in international fora. In these spaces, young leaders have come to play a crucial role in supporting and raising the voices of vulnerable groups, such as indigenous peoples and future generations.

The Youth4Ocean Forum is a free platform that provide young ocean leaders opportunities to speak up, share ideas, present projects and connect with other passionate young people and experts all over Europe. Through the Forum's Young Ocean Advocates programme, participants can improve communication, advocacy and networking skills and gain experience with concept development and management, all fundamental trainings to innovate and advance future projects. Moreover, acting as an umbrella and a network of virtuous and innovative projects developed by young people, the Forum proposes mentoring for project and skill development to upscale youth engagement in ocean restoration with a beneficial impact on biodiversity and the climate.

The Forum initiated several events that promote intergenerational dialogue and collaborations, intended to bridge the generation gap, promote understanding, and facilitate communication among people with different life-experiences, values, perspectives, and priorities. Two-way learning was encouraged to emphasise the intergenerational dialogue as an opportunity for mutual learning where both younger and older individuals can benefit from each other's insights and perspectives. Additionally, these events provided opportunities for real-world experiences to build youth capacity in advocacy, a crucial empowering skill to become active and engaged citizens who can express their ideas, influence decision-makers, and make positive change in their communities and the world.

Connecting young people of diverse cultural backgrounds and territorial contexts resulted in diverse perceptions of the climate crisis and a different level of ocean-climate literacy. By creating a common ground and a platform, connections and encounters with youth peers, senior experts and stakeholders are made, collaborations are initiated, relationships are built and alliances with like-minded organizations or individuals are formed to amplify messages and impact.

Recognised as a community under the umbrella of the EU4Ocean Coalition for ocean literacy, the Youth4Ocean Forum has become a key point for connecting young people with maritime and marine stakeholders such as foundations, institutions, academia, educators, NGOs, and the private sector and other ocean practitioners and knowledge-holders.

Integrating arts in ocean / climate learning experiences and citizen empowerment

Today's society often addresses environmental problems using science to define them and proposing policies as solutions. However, recent studies show that integrating arts in natural resource management courses and environmental thinking helps to improve understanding of climate change impacts, advances learning outcomes and creates novel ways of communicating about climate change, ultimately leading to out-of-the-box thinking, the development of new modalities of thought and the innovation of transdisciplinary solutions with the power to transform.[329]

New funding programs are being developed and attempts are being made by educational organisations, aquariums, science centres and Early Career Ocean Professionals network to apply such interdisciplinary and transdisciplinary approaches to enhance citizens' engagement in ocean protection and restoration and climate issues. These initiatives endeavor to stimulate public interest

Group. https://www.greenbiz.com/article/american-climate-corps-what-we-know-so-far#:~:text=Last%20week%2C%20the%20White%20House,Joe%20Biden%27s%20long%2Dterm%20goals.

329 Jacobsen, S., J. Seavey, R. Mueller. 2016. Integrated Science and Art Education for Creative Climate Change Communication. Ecology and Society, vol. 21, no3.; S.A. Ebbin. 2020. Immersing the arts: Integrating the arts into ocean literacy. Parks Stewardship Forum 36(3): 381–403.

Figure 6. Contemporary dance performance by school pupils in Boulogne sur Mer, France, 2019. Photo by D. Debove

Figure 7. Venice Climate Change Pavilion project: climate change data visualisation by Letizia Artioli

Figure 8. Augmented reality show in the Nausicaá aquarium

and fascination with ocean and waters by incorporating the arts in ocean literacy and STEM activities.

Digital technologies and capacity building

Digital technologies such as virtual reality (VR) and augmented reality (AR) have the potential to contribute to enhancing ocean and climate literacy by providing immersive and interactive educational experiences that foster a deeper understanding of the ocean and its ecosystems. They can enable users to explore the depths of the ocean virtually and observe marine organisms in controlled environments, providing a more engaging and accessible way to connect with the ocean and enable remote learners to access ocean education experiences that would otherwise be unavailable to them. Oceanographic phenomena that can be difficult to conceptualize, such as tides, currents, and weather patterns, can be simulated with digital technology. This experience enables users to experiment with different scenarios, simulate the impact of pollution, overfishing, and climate change on marine ecosystems and visualise projected future scenarios.

9.4 Public engagement and outreach: The role of communications in ocean and climate action

Strategic communication has long been an under-utilized approach in achieving ocean-climate action. Increased interest and investment in the practice since 2022 demonstrates recognition of communication as a tool to affect change rather than a project add-on or afterthought. Strategic communication is a multi-disciplinary approach that uses behavioural science, marketing, advertising, public relations, psychology and communication to affect change. It can be used to create a social mandate for change that lays the groundwork for effective ocean-climate action, as well as for more policy-specific campaigns.

Mainstreaming ocean-climate communication

At the UN Ocean Conference in 2022, the Calouste *Figure* Gulbenkian Foundation and Communications Inc. convened a conversation on how ocean-climate action can be accelerated through cross-sector influencing and engagement. The resulting paper highlighted the need for a collective approach and long-term focus to communication that can shift the public 'mood music' - or popular opinion, beliefs, attitudes and actions - thereby creating an enabling environment in which policy changes can better take root.[330] Mainstreaming the ocean-climate conversation requires engaging a wider range of voices, from media, culture, arts, sport, the private sector and beyond. The Schmidt Institute Ocean Rising project is making headway in creating innovative collaborations to reach wider audiences.[331]

Aligned ocean messaging

Considerable steps have been made towards combating the issue-based fragmentation of ocean communication,

330 Communications Inc, Caloutse Gulbenkian Foundation. 2022. Influence and Engagement: Priorities for Effective Ocean-Climate Communcation. https://cdn.gulbenkian.pt/uk-branch/wp-content/uploads/sites/18/2022/08/Influence-and-Engagement-Priorities-for-Effective-Ocean-Climate-Communication_-vF.pdf

331 See https://schmidtocean.org/wp-content/uploads/OceanRising.pdf for more information

with alignment of messaging elevating calls to action emerging from the ocean sector. The OneOcean Flotilla, established in 2019, is a collective effort of around 100 marine organizations worldwide that seeks to align messaging and calls for action at strategic moments. In 2022-23 the OneOcean Flotilla supported organizations with shared messaging and communications resources around key events including COP 27, the High Seas Treaty negotiations, the 5th International Marine Protected Area Congress (IMPAC5), Our Ocean Panama, the United Nations Open-ended Informal Consultative Process, G7 and G20. As part of this, the #OceanInTheRoom campaign, a shared project with SeaBlue Canada, was an unbranded effort that raised the profile of the ocean at important decision-making forums such as UNFCCC COP 27, CBD COP 15, IMPAC5 and beyond.[332]

Integrating the ocean into climate and biodiversity communication

Strategic communication is a vital component in better integrating the ocean into climate and biodiversity discussions. At COP27 the OneOcean Flotilla worked with the Nature Positive campaign and pavilion to embed the ocean into nature positive messaging and events, co-ordinating ocean-climate group asks and sharing these across the ocean community.

Analysis of mainstream media also indicated a gap in communication at the intersection of ocean and climate, with media outlets frequently relying on stock ocean images that failed to represent the breadth of human connection with the ocean. The Ocean Visuals project by Climate Outreach and Communications Inc responded directly to the need for more truly diverse and impactful imagery in ocean-climate storytelling.[333] New research and a call for images resulted in a library of 93 photos, available freely to media, nongovernmental organizations and educators. The resulting library of images have been used in mainstream outlets across the globe.

The Virtual Ocean Pavilion

The Virtual Ocean Pavilion (VOP) is an online platform dedicated to raising the visibility of the ocean and showcasing why the ocean matters in climate negotiations and to all life on our planet. It aims to increase knowledge, commitment and action for the ocean-climate nexus during and at key events in the run up to the COP since COP26. The Pavilion aims to:

- Raise the profile of the ocean among members of the ocean and climate community;
- Provide a communication platform for those who are unable to participate in COP events in person from various parts of the world;
- Address COP priorities while promoting the space for ocean in the climate conference; and
- Promote cross-sectoral cooperation and collaboration

332 For more information, see: https://oceanintheroom.org

333 For more information, see: https://climatevisuals.org/oceanvisuals/

on ocean-climate action at the national, regional, and global levels.

The first ever VOP at the UNFCCC COP26 was the product of a coordinated effort among the Global Ocean Forum, Plymouth Marine Laboratory, the Ocean Policy Research Institute of the Sasakawa Peace Foundation, the Oceano Azul Foundation, and the Intergovernmental Oceanographic Commission of UNESCO under the Roadmap to Oceans and Climate Action (ROCA) Initiative, along with 30 collaborating partners. The Pavilion, which was live from October 31 until November 12, 2021, served as a platform for the amplification of the voice of the ocean and for raising the visibility of ocean issues during climate negotiations at COP26. Due to the virtual nature of the Pavilion, which was held fully online, the Pavilion was able to reach a wider audience, including those who were unable to attend the COP in person due to COVID-19.

The COP27 Virtual Ocean Pavilion was held in 2022, opening during Africa Climate Week (August 29-September 2, 2022) and covering the duration of UNFCCC COP27 (6-18 November 2022). With the overall coordination by the Global Ocean Forum in close partnership with the Plymouth Marine Laboratory, it was co-organized by the GOF, PML, IOC-UNESCO, FAO, One Ocean Hub, and the Ocean & Climate Platform, together with 28 collaborating partners. The Pavilion drew 1,313 visits from registrants representing 115 countries.

The Pavilion offered live days and sessions linking the ocean with the themes of the Marrakech Partnership for Global Climate Action and the Subsidiary Body for Scientific and Technological Advice (SBSTA) Ocean and Climate Change Dialogue themes to provide input to these discussions as well as a live day on Aquatic Food, organized by the FAO, One Ocean Hub, and European Bureau for Conservation and Development (EBCD). Exhibits on major ocean-related events in 2022 showcased national and international initiatives on ocean and climate. The VOP provided multiple opportunities for networking and developing synergies among attendees, educational and fun features on the platform and in the booths, a gateway to ocean and climate stories from around the world, and links to other ocean events at and around the COP.

Overall, the Virtual Ocean Pavilion at COP27 was successful in achieving its goals of amplifying the visibility of the ocean-climate nexus and further democratizing the COP, bringing it to a wider audience than would be able to physically attend the conference in person. The VOP was useful in compiling all the ocean-related activities at the COP, providing a roster of over 200 ocean-related events and helping to promote the ocean agenda.

The Virtual Ocean Pavilion returns in 2023 for the UNFCCC COP28 to continue the ongoing work of increasing recognition of the vital importance of the ocean to global efforts in mitigating and adapting to the impacts of climate change, and to advance the goal of connecting the people in our incredible blue planet. The Global Ocean Forum is committed to organizing the COP28 VOP to be user-friendly, informational and accessible, with plans to streamline user experience and add new and exciting features to this year's VOP.

One Ocean Learn Platform

The One Ocean Learn Platform[334] is an initiative of the One Ocean Hub in partnership with the United Nations Institute for Training and Research (UNITAR). This platform supports capacity building by translating ocean knowledge that is generated across international, national and local scales into action-oriented training suitable for activists, development practitioners, policy makers and others. Knowledge across different sources is integrated to enhance capacities to address real-world questions and understand experiences. Information exchange and dialogue through the platform can encourage more sustainable decisions for the ocean. There are several pathways[335] navigating the users through knowledge and supporting the user's ability to influence ocean issues. Pathways include climate change and the ocean, gender, children's rights, inclusion of indigenous and local knowledge and illegal, unreported and unregulated (IUU) fishing.

Future needs

At the Influence and Engagement event at UN Oceans Conference (UNOC) 22, ocean and climate practitioners identified five shared areas for communications action and resourcing by the sector. By focusing on these areas and aligning efforts, the potential of strategic communication can be better realised, and ocean-climate action can be accelerated. These five priority areas are:

1. **Creating a social mandate for change:** We need the public to be behind ocean action. Impact comes when there is a social mandate for change. To achieve this, we need to change mindsets and behaviors at scale.
2. **Long-term strategies with commensurate support:** Ocean communications needs significantly greater investment. Practitioners need to think bigger and engage with other sectors as well as newer au-

334 https://www.oneoceanlearn.org/about/
335 https://www.oneoceanlearn.org/learning-pathways/

diences. Funders need to invest in 'riskier' but more impactful areas such as narrative change, media partnerships, and consistent campaigning to reach atypical audiences.

3. **Better representation and reach:** For mass change we need a multitude of voices, but ocean-climate communication lacks diversity. We need more voices from the Global South and young people, and power needs to be devolved to underrepresented groups. Learning from the psychology of behavior change, we need to use audience-relevant messengers.
4. **Development of the research**: A particular area of need is long term tracking of ocean-climate perceptions and behaviors. If we want to take a long-term approach to change, we need to put in place ways to monitor and evaluate the impact — to show where we are having an effect, to change our course when necessary, and to be sure we are using resources to do the right thing in the right way.
5. **Creating an architecture that incorporates evidence and action:** We need to ensure that research is shared across the ocean sector and translated into actionable insight and, subsequently, action. We need to create an architecture that enables the sharing of research as a collaborative resource. Practitioners need to integrate these findings into campaign approaches to ensure we are all adopting the most informed communications practice.

9.5 Mainstreaming gender in ocean and climate action

Addressing challenges from climate change requires the adoption of an overarching societal approach. Social groups, including economically disadvantaged, women, peoples of colour, indigenous peoples, and immigrants, are distinctly affected by climate change, deepening persistent global inequalities. Social disparities are amplified depending on additional aspects such as exposure, sensitivity, and capability to adapt to change.[336] Therefore, addressing climate change effects and action requires the consideration of distinct human realities, vulnerabilities and the numerous layers of complexity that can attenuate or amplify challenges.

Women and men, for instance, use the ocean space differently. Women are largely engaged in onshore activities such as seaweed farming and invertebrate collection, whereas men dominate offshore activities such as deep-sea exploration, mining, or fishing. Marine fisheries are marked by significant occupational segregation, with men primarily involved in fish harvesting and women largely concentrated in low-skilled, low-paid secondary jobs such as fish processing and marketing.[337] As climate change intensifies, women and men feel the impacts of degraded ocean ecosystems in different ways due to their differentiated roles in society, which expose them to gender-based violence, increased workloads, and higher vulnerability to droughts and flooding.[338]

Mainstreaming gender in the interface of the ocean and climate is crucial in ensuring effective ocean governance and climate-resilient society.[339] . The inclusion of women's voices, particularly when they have not previously been recognized, brings a more complete picture of socio-ecological linkages between marine ecosystems, people, and climate change.[340]

Gender biases in ocean science and climate-related discourses still influence the participation and interactions of women towards ocean solutions and processes. In most nations, women have not yet reached parity in senior roles in ocean science and decision-making[341] and studies show that the number of women in leadership positions declines with the advancement of careers.[342] Critically, women are well-known to be more active in advocating for the common good in climate-related mitigation and adaptation measures, as well as marine conservation and compliance, raising very important and often ignored concerns.[343] In practice, such disparity in scientific and decision-making is translated into less access to financial resources and professional opportunities to reflect and propose climate solutions. Such challenges are also present in the field of entrepreneur-

336 Axelroad, M., Vona, M., Colwell, J.N., Fakoya, K., Salim, S.S., Webster, D.G., de la Torre-Castro. 2022. Understanding gender intersectionality for more robust ocean science. Earth System Governance 13 (100148). https://doi.org/10.1016/j.esg.2022.100148

337 Michalena, E., Straza, T. R., Singh, P., Morris, C. W., & Hills, J. M. 2020. Promoting sustainable and inclusive oceans management in Pacific islands through women and science. Marine Pollution Bulletin, 150, 110711. https://doi.org/10.1016/j.marpol.2018.03.011

338 McLeod, E., Arora-Jonsson, S., Masuda, Y.J., Bruton-Adams, M., Emaurois, C.O., Gorong, B., Hudlow, C.J., James, R., Kuhlken, H., Masike-Liri, B., Musrasrik-Carl, E., Otzelberger, A., Relang, K., Reyuw, B.M., Sigrah, M., Stinnett, C., Tellei, J. and Whitford, L. 2018. Raising the voices of Pacific Island women to inform climate adaptation policies. Marine Policy 93, 178-195. https://doi.org/10.1016/j.marpol.2018.03.011; UN Women. 2022. Explainer: How gender inequality and climate change are interconnected. Available at:< https://www.unwomen.org/en/news-stories/explainer/2022/02/explainer-how-gender-inequality-and-climate-change-are-interconnected#:~:text=The%20climate%20crisis%20is%20not,less%20access%20to%2C%20natural%20resources.>

339 Gissi, E., Portman, M. E., & Hornidge, A. K. 2018. Un-gendering the ocean: Why women matter in ocean governance for sustainability. Marine Policy, 94, 215-219. https://doi.org/10.1016/j.marpol.2018.05.020

340 Friedman, W.R., Halpern, B.S., McLeod, E., Beck, M.W., Duarte, C.M., Kappel, C.V., Levine, A., Sluka, R.D., Adler, S., O'Hara, C.C., Sterling, E.J., Tapia-Lewin, S., Losada, I.J., McClanahan, T.R., Pendleton, L., Spring, M., Toomey, J.P., Weiss, K.R., Possingham, H.P., Montambault, J.R. 2020. Research Priorities for Achieving Healthy Marine Ecosystems and Human Communities in a Changing Climate. Frontiers in Marine Science, Volume 7. https://doi.org/10.3389/fmars.2020.00005

341 IOC-UNESCO. 2020. Global Ocean Science Report 2020–Charting Capacity for Ocean Sustainability. K. Isensee (ed.), Paris, UNESCO Publishing.

342 Giakoumi, S., Pita, C., Coll, M., Fraschetti, S., Gissi, E., Katara, I., ... & Micheli, F. 2021. Persistent gender bias in marine science and conservation calls for action to achieve equity. Biological Conservation, 257, 109134.; Grogan, K. 2019. How the entire scientific community can confront gender bias in the workplace. Nature Ecology & Evolution, vol. 3, p.3-6. https://doi.org/10.1038/s41559-018-0747-4;IOC-UNESCO. 2020. Global Ocean Science Report 2020–Charting Capacity for Ocean Sustainability. K. Isensee (ed.), Paris, UNESCO Publishing.

343 Agarwal, B. 2009. Gender and forest conservation: The impact of women's participation in community forest governance. Ecological Economics, 68(11), 2785–2799. https://doi.org/10.1016/j.ecolecon. 2009.04.025; Leisher, C., Temsah, G., Booker, F., Day, M., Agarwal, B., Matthews, E., … Wilkie, D. 2015. Does the gender composition of forest and fishery management groups affect resource governance and conservation outcomes: A systematic map protocol. Environmental Evidence, 4(1), 1–7. https://doi.org/10.1186/s13750-015-0039-2

ship, where women still face misleading stereotypes[344] and less confidence from investors.[345] There is an urgent need to pay attention to the structural and systematically ingrained barriers in institutions that exacerbate gendered ocean science, industries and decision-making.

Gender imbalances are a reality in our modern world and will remain for approximately 130 years.[346] Some of the recommendations to foster gender mainstreaming in ocean and climate action include formulating gender-transformative institutional policies; challenge gender preconceptions, stereotypes and cultural norms; ensure equal access to ocean literature and climate-related educational programmes; equal opportunities and representation of women and men in decision-making processes by prioritizing the voices of the most marginalized in the society; tailored programmes that incentivize the development of skills and support leveraging women's careers; use of gender-sensitive language to make both women and men visible; and gender-specific data collection and analysis to take into account the concerns and needs of different both genders.

9.6 Summary of achievements and future needs

Ongoing capacity development since 2021 has resulted in many successes and revealed key lessons that will enable the development of action items informed by identified needs for the future. Strategies for successful capacity building vary greatly across regions, ecosystems, cultures, generations, and genders. Furthermore, there are widespread knowledge gaps that limit the ability to successfully facilitate progress. Capacity building efforts by a wide range of organizations demonstrate that ocean literacy can be achieved when knowledge is equitably accessible and has personal relevance and connection. Key markers of successful programs include 1) flexibility and adaptation; 2) financial accessibility; 3) local expertise; and 4) global collaboration.

Recognizing the vital role the ocean plays in weather, climate change mitigation, and providing resources elevates general interest in the ocean from all quarters, political, commercial, science and society. The IOC Ocean CD-Hub enables equitable access to access critical information on capacity development opportunities for ocean science related training, research, data sharing, information, jobs, grants, materials, and sources of data and information technology.

Young people are the future of global climate and ocean advocacy efforts, and ensuring intergenerational dialogue across international efforts facilitates the development of hard and soft skills young professionals will need to continue the legacy of climate, biodiversity, and ocean action.

Integrating the arts into natural resource management can provide more robust and durable conceptions of the ocean leading to a richer knowledge of the ocean, enhance the process of learning and becoming ocean literate, generate value-driven or emotional responses that may catalyse conservation action and shape environmental behaviour.

Analysis of mainstream media also indicated a gap in communication at the intersection of ocean and climate, with media outlets frequently relying on stock ocean images that failed to represent the breadth of human connection with the ocean. Aligned messaging through the efforts of the OneOcean Flotilla resulted in shared messaging and communications resources around key events including COP27, the High Seas Treaty negotiations, the 5th International Marine Protected Area Congress (IMPAC5), Our Ocean Panama, the United Nations Open-ended Informal Consultative Process, G7 and G20. Virtual platforms such as the Virtual Ocean Pavilion successfully amplify the visibility of the ocean-climate nexus and further democratizing the COP by bringing it to a wider audience than would be able to physically attend the conference in person.

Finally, mainstreaming gender in the integrated management of marine and coastal ecosystems is globally recognized as a priority for ocean-climate initiatives. Women are well-known to be more active in advocating for the common good in climate-related mitigation and adaptation measures as well as marine conservation and compliance, and gender disparity in scientific and decision-making is translated into less access to financial resources and professional opportunities to reflect and propose climate solutions. Mainstreaming gender inequalities in the interface of the ocean and climate is crucial in ensuring effective ocean governance and climate-resilient society.

344 Global Entrepreneurship Monitor. 2022. Global Entrepreneurship Monitor 2021/22 Women's Entrepreneurship Report: From Crisis to Opportunity. London: GEM.

345 Brooks, W., Huang, L., Kearney, S.W. and Murray, F.E. 2014. Investors prefer entrepreneurial ventures pitched by attractive men. Investors prefer entrepreneurial ventures pitched by attractive men. Psychological and Cognitive Sciences 111 (12), p. 4427-4431. https://doi.org/10.1073/pnas.1321202111

346 World Economic Forum. 2023. Global Gender Gap Report 2023. Insight Report. June 2023. Available at:< http://reports.weforum.org/global- gender-gap-report-2023>.

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10. CLIMATE CHANGE AND ABNJ

10.1 Climate change and the new BBNJ Agreement

To address biodiversity loss, the Convention on Biological Diversity's Kunming-Montreal Global Biodiversity Framework has set the goal of protecting 30% of the planet's area, including marine and coastal areas.[347] In the marine space, this can only be achieved by significantly increasing the 1.4% of protections in areas beyond national jurisdiction (ABNJ).[348] Biodiversity in this realm (from microbes and phytoplankton to fish and whales) provides extensive carbon services (carbon fixation, transfer, storage and sequestration) responsible for controlling the climate.

Conservation and sustainable use of biodiversity in ABNJ are the focus of a new international BBNJ Agreement opened for signature by states on 20 September 2023. In an encouraging diplomatic flurry, 66 UN member states, the European Union and one permanent observer to the UN signed the instrument on the opening day, which further increased to 83 signatures by the close of the UN High-Level Week.[349] There is potential to harness the elements of this agreement to increase climate resilience and support the critical carbon cycling services provided by the ocean. These goals are explicitly recognized in sub-paragraph (h) of Article 7 General Principles and Approaches of the BBNJ Agreement[350] which states: "An approach that builds ecosystem resilience, including to adverse effects of climate change and ocean acidification, and also maintains and restores ecosystem integrity, including the carbon cycling services that underpin the role of the ocean in climate". Of note, the climate provisions of the BBNJ Agreement have already been highlighted in recent submission to the International Tribunal for the Law of the Sea to inform the requested Advisory Opinion on Climate Change and International Law.[351]

The four elements of the BBNJ Agreement are all important. These include 1) marine genetic resources, including the fair and equitable sharing of benefits; 2) measures such as area-based management tools, including marine protected areas; 3) environmental impact assessments; and 4) capacity building and the transfer of marine technology. Area based management tools, especially fully and highly protected MPAs and other effective area-based conservation measures (OECMs), can sustain the diversity that allows adaptation to climate change, provide corridors and refugia for species migrating in response to climate change, and can conserve and restore species and ecosystems that remove and sequester CO2 from the atmosphere. Environmental impact assessment (EIA) processes can consider direct and cumulative climate impacts, ensuring that activities in ABNJ minimize climate risk. Strategic environmental assessments (SEAs), while not mandatory, may prove a vital tool for regional collaboration to assess current and potential future climate and other impacts and identify collective research priorities, as a basis for coordinated action. Marine genetic resources (MGR) can help with the identification of species and assessment of ecosystems to be targeted for climate solutions with global benefits and benefit sharing. Even the future monetary benefit sharing derived from commercialization of MGRs that will be channeled back to the BBNJ Agreement funding mechanism can increase financial resources to undertake more pro-climate and pro-biodiversity activities. Climate can and should feature in capacity development and marine technology transfer, and this is reflected in Annex II,[352] to provide the scientific observation, monitoring, modeling and mapping required for successful climate-positive implementation of the BBNJ Agreement elements.

ABNJ is often considered beyond the explicit scope of the UNFCCC regime, which focuses largely on national and regional efforts. However, the UNFCCC does commit States Parties in Article 4 to "[p]romote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems";[353] Article 5.1 of the Paris Agreement further re-enforces this commitment: "Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4,

347 See https://www.cbd.int/gbf/targets/3/ The quantitative element of the target specifies that, globally, at least 30 per cent of terrestrial and inland water areas, and at least 30 per cent of marine and coastal areas should be conserved or protected by 2030.

348 CBD/COP/15/9 entitled Review of Progress in the Implementation of the Convention and the Strategic Plan for Biodiversity 2011-2022 (dated 30 October 2022) which states "14. As of October 2022, the percentage of terrestrial and inland water areas covered by protected areas and other effective area-based conservation measures (OECMs) reached almost 17 per cent (15.8 per cent protected areas and 1.2 per cent OECMs). In the marine realm, 8.3 per cent of marine area is covered by protected areas and OECMs (18.7 per cent of exclusive economic zones, 1.4 per cent of areas beyond national jurisdiction). Of this 8.3 per cent, the large majority is covered by protected areas (8.2 per cent under protected areas and 0.1 per cent under OECMs)."

349 See https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXI-10&chapter=21&clang=_en for more information on High Seas Ratification Tracker, which is also tracking the number of signatures.

350 Also, the third preambular paragraph states: "Recognizing the need to address, in a coherent and cooperative manner, biological diversity loss and degradation of ecosystems of the ocean, due, in particular, to climate change impacts on marine ecosystems, such as warming and ocean deoxygenation, as well as ocean acidification, pollution, including plastic pollution, and unsustainable use,"

351 See ITLOS/PV.23/C31/4 – (12 September 2023 p.m.) available at https://itlos.org/fileadmin/itlos/documents/cases/31/Oral_proceedings/ITLOS_PV23_C31_4_E.pdf

352 The relevant part of Annex 2 states: "Under this Agreement, capacity-building and transfer of marine technology initiatives may include but are not limited to:
. . . (b) Information dissemination and awareness-raising, including regarding:
. . . (iv) Stressors on the ocean that affect marine biological diversity of areas beyond national jurisdiction, including the adverse effects of climate change, such as warming and ocean deoxygenation, as well as ocean acidification;"

353 See UNFCCC Article 4(1)(d) at https://unfccc.int/resource/docs/convkp/conveng.pdf

paragraph 1(d), of the Convention".[354] Thus, the fact that activities occur in ABNJ should not technically be a clear policy barrier to comprehensively optimizing global carbon services. During the UNFCCC Parties´ mandated Ocean and Climate Dialogue the relevance of the BBNJ Agreement was acknowledged as one of "five recent achievements in multilateral negotiations in the global race to protect the ocean." Furthermore, the Dialogue´s report encouraged addressing the perceived barrier by recommending the strengthening of institutional linkages as a Key Message to Parties and to COP28.[355] Additional recommendations include specifically building synergies for coastal and marine nature-based solutions and biodiversity and blue carbon ecosystem-based management across international policy processes. This can serve to further centralize the role of the ocean in climate change mitigation and adaptation through UNFCCC processes, including the Global Stocktake (GST).

It will be essential for ocean champions to encourage States and non-state actors to harness a new breakthrough initiative for biodiversity and nature-based carbon services in ABNJ. Beyond the BBNJ agreement, human activities that emit or release CO2 as well as those intended to sequester CO2 (CDR) in ABNJ will require global scrutiny and harmonization across a range of international governance bodies: UNFCCC, International Seabed Authority (ISA), International Maritime Organization (IMO), London Convention and London Protocol (LC/LP), Convention on Biological Diversity (CBD), and others. While the BBNJ Agreement's EIA and SEA procedures may be applicable in part, new governance arrangements for both CDR and Solar Radiation Management affecting ABNJ may need to be considered to avoid certain technologies slipping through the existing regulatory mechanisms.

10.2 Climate change and deep-sea mining

In his November 2022 address at COP27 in Sharm El Sheikh, France's President Emmanuel Macron surprised everyone when he called for a prohibition on deep-sea mining. This address went beyond adding his voice to those who had already called for a moratorium or a precautionary pause on deep sea mining. By calling for an outright ban, President Macron was lifting the bar on an emerging issue at the crossroad of marine biodiversity and climate. In the months following COP27, 23 countries have formed a coalition seeking to prevent the International Seabed Authority (ISA) from giving a green light to deep-sea mining, a controversial emerging extractive industry. At the time of publication, this list includes Brazil, Canada, Chile, Costa Rica, Dominican Republic, Ecuador, Federated States of Micronesia, Fiji, Finland, France, Germany, Ireland, Monaco, New Zealand, Palau, Panama, Portugal, Samoa, Spain, Sweden, Switzerland, UK and Vanuatu. More countries are expected to join that coalition in the coming months.

Mineral resources found on and under the seabed have been unattainable for the mining industry in past decades, and their exploitation is now technically feasible. Both economic and environmental aspects of seabed mining remain untested, with potential irreversible environmental damage and equity issues as causes for concern. According to the UN Convention on the Law of the Sea (UNCLOS), mineral resources of the seabed Area beyond national jurisdiction are part of the common heritage of humankind, and their exploration and exploitation are regulated by the ISA headquartered in Kingston, Jamaica.

In recent years, the ISA has granted exploration licences to a number of sponsoring countries and their contractors. Should exploitation begin, the ISA is meant to equitably distribute any arising benefits while also protecting the marine environment for the benefit of humankind, including future generations. Equity concerns are not limited to the distribution of benefits. The impact of mining on legitimate uses of the sea such as fishing and genuine scientific research also warrant apprehension.

Potential climate impacts are an additional concern. It is estimated that the high seas take up 500 million tons of atmospheric carbon per year, which ultimately becomes trapped in ocean sediments. In the long term, the possible remobilisation of CO2 by deep-sea mining machinery and its release into the atmosphere raises intergenerational equity concerns. In the short term, the impact of deep-sea mining on biodiversity could affect the carbon pump that absorbs CO2 daily.[356]

The ISA has been discussing for some time the adoption of a mining code that some believe would prevent irreversible environmental impacts.[357] Others consider the opposite: if rushed, it would give a clean bill of health to deep-sea mining despite irreversible damage. Concerns have been heightened by a move by the Republic of Nauru, a small island developing State in the South Pacific.

354 Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104. See Paris Agreement Article 5(1) at https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf

355 The summary report states: "13. Institutional linkages must be strengthened between partners at national and international levels and across UN mandates and processes such as the International legally binding instrument under United Nations Convention of Law of the Sea for the conservation and sustainable use of marine biological diversity beyond national jurisdiction and the Kunming-Montreal Global Biodiversity Framework to enhance global ambition and action for a climate resilient ocean."

356 Levin, L. A., & Le Bris, N. 2015. The deep ocean under climate change. Science, 350(6262), 766-768.

357 For more information on the ISA mining code, see: https://www.isa.org.jm/the-mining-code/working-groups/

Under pressure from its Canadian contractor, The Metals Company, a so-called two-year rule was activated in 2021. Under UNCLOS, this contemplates the consideration and provisional approval of plans to go ahead with deep-sea mining within two years unless two thirds of the members of the ISA Assembly reject the plans.[358]

In an open letter to all ISA Council Members March 2023, the Director General of the International Union for the Conservation of Nature (IUCN) presented a reminder that "IUCN Member States, civil society and Indigenous organisations overwhelmingly voted in support of a moratorium on deep seabed mining to protect life in the ocean" at the World Conservation Congress held in Marseille, France, in September 2021.[359]

Manganese, nickel, cobalt and copper are the main metals targeted by the proponents of deep-sea mining who argue that they can provide key elements for the ongoing energy transition. However, car companies such as Volvo, Renault and Volkswagen, and tech companies such as Samsung, Philips and Google have all gone on record to say that they do not need nor want to use deep-sea minerals.[360] In their 2022 updated financial guidelines to the extractive sector, the UNEP Finance Initiative said categorically that deep-sea mining is not considered part of the sustainable blue economy.[361] Numerous financial institutions are thus also "pre-divesting" from the sector.

Action by the countries opposed to deep-sea mining has postponed attempts to rush the adoption of the deep-sea mining code at the July 2023 ISA Council and Assembly. It is now expected that the ISA will wait until 2025 to consider whether to authorize or stop deep-sea mining. The 29th Assembly meeting in July 2024 will include the election of a new ISA Secretary General and the potential adoption of a second periodic review, in line with the requirement under UNCLOS to conduct such a review every five years.[362] If fully independent, this review would assess accountability and oversight of the ISA. The ISA Strategic Plan was extended until 2025, thus potentially allowing the review to inform the content of the new Strategic Plan.[363]

358 DSM Observer. 2022. Legal Consequences of the Two-Year Rule at the ISA and Implications of Missing the Deadline: Interview with Pradeep Singh. https://dsmobserver.com/2022/08/legal-consequences-of-the-two-year-rule-at-the-isa-and-implications-of-missing-the-deadline/

359 WCC-2020-Res-122-EN, see https://portals.iucn.org/library/sites/library/files/resrecfiles/WCC_2020_RES_122_EN.pdf ; IUCN. 2023. IUCN Director General's open letter to ISA Members on deep-sea mining. https://www.iucn.org/dg-statement/202303/iucn-director-generals-open-letter-isa-members-deep-sea-mining

360 WWF. 2021. Business backlash against deep-sea mining grows. https://wwf.panda.org/wwf_news/?4541466/Business-Backlash-Against-Deep-Sea-Mining-Grows

361 UNEP. 2022. Harmful Marine Extractives: Deep-sea Mining. https://www.unepfi.org/publications/harmful-marine-extractives-deep-sea-mining/

362 Cremers, K., Chazot, C., Singh, P. & Rochette, J. 2023. Time to evaluate: Towards the second periodic review of the International Seabed Authority. https://www.iddri.org/en/publications-and-events/policy-brief/time-evaluate-towards-second-periodic-review-international

363 Ibid.

10.3 Summary of achievements and future needs

Climate change and biodiversity loss are two of the major planetary crises, that, while inextricably intertwined in the ocean, are typically addressed separately. Wide arrays of multilateral agreements and processes by diverse multilateral institutions and platforms with participation of national representatives, often from different national institutions, add layers of complication to already complex discussion. Encouragingly, however, biodiversity conservation and sustainable use in the high seas and seabed area beyond national jurisdiction are the focus of the new BBNJ agreement, which opened for signatures in September 2023 and is also receiving increasing attention from the UNFCCC.[364] Challenges centering on extractive industries such as deep-sea mining remain unresolved in the ABNJ, even with growing support for the BBNJ agreement to conserve and sustainably use marine biodiversity beyond national jurisdiction.

Given the current lack of dedicated funding resources to support BBNJ implementation and debilitating global debt upon developing countries, it will be a challenge to advance early implementation of the BBNJ Agreement. Such early action will be necessary to establish critical institutions and sub-bodies in time to meaningfully advance the 30 by 30 goal in ABNJ.[365] There is hope as over 80 States have signed the BBNJ agreement and are now pursuing ratification, and State and non-State actors are stepping up to address capacity building concerns for BBNJ ratification and implementation.

The delay to 2025 for the decision from the ISA to authorize deep-sea mining, or not, allows time for the global community to reconcile their stance on deep-sea mining with ongoing current scientific research, which can better inform our understanding of expected impacts. As of November 2023, 23 countries call for a moratorium, pause or a ban on deep-sea mining. This ongoing discussion will be critical as the ISA periodic review and Strategic Plan develop over the next two years.

364 See https://www.realinstitutoelcano.org/en/commentaries/marine-protection-and-the-high-seas-treaty-a-big-deal/ for more information on the relationship between BBNJ and the ISA.

365 Gjerde, K.M., Clark, N.A., Chazot, C. et al. 2022. Getting beyond yes: fast-tracking implementation of the United Nations agreement for marine biodiversity beyond national jurisdiction. Ocean Sustain 1, 6 (2022). https://www.nature.com/articles/s44183-022-00006-2

11. THE WAY FORWARD FOR THE OCEAN-CLIMATE COMMUNITY AT THE UNFCCC AND BEYOND

11.1 The ROCA legacy

The ROCA initiative promoted the wide dissemination of information targeting decision-makers at the UNFCCC and beyond. These efforts emphasize the undeniable evidence of the importance of oceans, the central role the oceans play in regulating the climate system, and the dire consequences of inaction, especially through the organization of Oceans Action Days at the COPs and through the ROCA Initiative's annual reports on Assessing Progress on Ocean and Climate Action.[366]

A Global Ocean Forum strategic planning working group on ocean and climate is currently developing a successor strategy that takes into account the need for: 1) expansion of the ocean and climate community's engagement to include organizations which have a comparative advantage in leading the work on the candidate priority areas of the new strategy; 2) establishment of an informal but stable funding mechanism to support the implementation of the new strategy; and 3) keeping track of and building on how its initiatives can successfully contribute to the achievement of the Paris Agreement targets.[367]

11.2 Key areas for future action

The previous report identified key areas for future action including:

1) Promote the current trajectory set in motion by Parties and non-Party stakeholders, including the Ocean Pathway Partnership, Because the Ocean, among others, to pursue a proper recognition of the importance of oceans in the climate change process and ambition under the Paris Agreement.
2) Explore and exploit the opportunities and pathways that may be available within the UNFCCC to advance the ocean and climate nexus, including:
    a. Promote the adoption of the Ocean and Coastal Zones action pathway under the Marrakech Partnership for Global Climate Action at the regional, national, and sub-national levels, the achievement of the 2030 Race to Zero Breakthrough target for oceans and coastal zones, and development of cross-sectoral cooperation and collaboration on ocean and climate change action among stakeholders under the MP-GCA platform.
    b. Support the pursuit of the recommendations emanating from the SBSTA Ocean and Climate. Change Dialogues, including:
        i. strengthening cooperation and synergies among relevant UN bodies in tackling ocean;
        ii. and climate change;
        iii. further strengthening the ocean-climate nexus under the existing UNFCCC processes; and
        iv. empowering Parties and non-Party stakeholders to carry out increased ambition that includes ocean action and integrating ocean-based solutions into NDCs, NAPs and other national processes through science, finance, and capacity building.
3) Promote the strengthening of finance, technology transfer, and capacity-building and public outreach, among other cross-cutting support for ocean-based mitigation and adaptation strategies.[368]

The following are specific key areas for future ocean and climate action.

Climate change, poverty and vulnerability

The latest IPCC report notes that 3.3 billion-3.6 billion people live in countries highly vulnerable to climate impacts, with SIDS, the Arctic, South Asia, Central and South America, and much of sub-Saharan Africa.[369] The report further notes that the impacts are compounded through many factors including inequity, conflict, poverty, weak governance, and the inability of communities to adapt to climatic changes.

The IPCC notes that at least 170 countries' climate policies now include adaptation, but many have yet to move beyond planning into implementation. The IPCC finds that efforts today are still largely incremental, reactive and small-scale, with most focusing only on current impacts or near-term risks. According to the report, adaptation needs are estimated to reach $127 billion and $295 billion per year for developing countries alone by 2030 and 2050, respectively.

The World Bank notes that poorer nations are disproportionately vulnerable to climate change for a number of reasons including a) lack of economic resources; b) infrastructure; c) technology; d) human capacity; and e) social safety nets. These challenges result in the inability to adapt and cope with weather hazards. Additionally,

366 Assessing Progress on Ocean and Climate Action: 2020-2021: https://rocainitiative.files.wordpress.com/2021/11/roca-progress-report-2020-2021.final_.pdf
367 Ibid.
368 Ibid.
369 World Resources Institute. 2022. "6 Big Findings from the IPCC 2022 report on Climate Impacts, Adaptation and Vulnerability". www.wri.org

they are ill-prepared in terms of coastal protection, lacking early warning and disaster response systems, and recovery assistance.[370]

Additionally, for many of the less developed countries, climate change is just one of the numerous challenges they face including population growth, depleting resources, inadequate services including health and education. The poor are more vulnerable to climate change such as sea-level rise, salt intrusion into agricultural lands, hurricanes and floods. These shocks lead to the loss of livelihood, shelter, a reduction in the ecosystem goods and services they rely upon, and an increase in energy prices.

The report notes that in the absence of social safety nets, climate change is likely to represent a major obstacle to alleviating poverty. While climate policies are compatible with poverty reduction, they will only be effective if: (a) poverty concerns are carefully considered in their design and (b) they are accompanied by the appropriate set of social policies. The situation is exacerbated by the fact that climate change will cause more frequent and more severe shocks leading to greater and more serious impacts.[371]

While the IPCC and numerous development agencies have noted the above issues, there has not been a significant increase in financing directed at addressing these challenges in developing nations. Future action should include investments in assisting the poorer nations to formulate and implement well-designed climate policies that integrate poverty and vulnerability. There should also be capacity building and investments in technological development and dissemination, increase efficiency through the economic system, catalyze smart investment in efficient and low-carbon infrastructure, and include strong distributional policies to support the weakest and most vulnerable.

Deriving energy from wind and offshore solar panels

Deriving energy from wind and offshore solar panels is very significant in reducing emissions from fossil fuel use, and to reach targets of net-zero emissions. Floating solar photovoltaics and wave energy converters will play an important role in removing fossil fuels from the energy economy.[372] Floating offshore technologies will be able to help efforts to replace fossil fuels with renewable energy solutions by 2030. For this to be technically feasible at a relatively acceptable cost, there would be the need to import the needed carbon neutral synthetic e-fuels or set up local production for e-fuels.[373]

The Government of Singapore, in 2021, launched its "Green Plan 2030" to halve the country's greenhouse gas emissions by 2050. Singapore's location almost on the equator, results in getting more than average sunlight.[374] Sunseap Group, a local solar energy solutions provider, has developed a 5-megawatt solar project in Singapore. The government launched the project in 2021 in the Straits of Johor. It includes a 5-hectare plant with 13,312 solar panels, 40 inverters and more than 30,000 floats,

370 Hallegatte, Stephane and Bangalore, Mook and Bonzanigo, Laura and Fay, Marianne and Narloch, Ulf and Rozenberg, Julie and Vogt-Schilb, Adrien. 2014. Climate Change and Poverty -- an Analytical Framework. World Bank Policy Research Working Paper No. 7126, Available at SSRN: https://ssrn.com/abstract=2531160

371 Ibid.

372 Keiner, D., Salcedo-Puerto, O., Immonen, E., van Sark, W. G., Nizam, Y., Shadiya, F., ... & Breyer, C. 2022. Powering an island energy system by offshore floating technologies towards 100% renewables: A case for the Maldives. Applied Energy, 308, 118360.

373 Ibid.

374 "Singapore's Journey Towards Carbon Neutrality". 2021. www.pv-tech.org

which is estimated to produce up to 6.022,500 kWh of energy annually, offsetting an estimated 4,258 tons of carbon dioxide.[375]

Wind power generation can also be incorporated into the PV floating platform solutions.[376] In such projects, the platform is composed of a frame structure, which is used to mount PV modules and wind power units. However, there are significant challenges in moving forward with photovoltaics (PV) development. They include: a) space restrictions which may limit expansion; b) high initial investment, which poorer nations, despite urgent need, may not be able to afford; (c) anti-corrosion protection, particularly for electrical equipment; d) necessity to build sound wave protections facilities; (e) need to consider the impact of sea ice; and (f) need for assessment of storm surges.[377]

Given these challenges, future action should include further research both on technology and cost-effective solutions, to promote and expand wind and offshore solar projects. The lessons learned from ongoing projects around the world will be critical in this context. For the less developed countries, targeted capacity building in research and technology will be critical. Capacity will also need to be built in making realistic cost estimates and financing requirements.

Accessing climate finance

The International Energy Agency estimates that the total cost of investment to meet climate goals may amount to almost US$ 1 trillion per year between 2020 and 2030. Funding for climate change mitigation and adaptation can be derived from a variety of sources, including public and private, bilateral and multiple, as well as alternative sources. A variety of organizations are involved in disbursing climate funds. They include local, regional, national, or international organizations from the public and private partnerships (PPP), local financial institutions and banks, multilateral organizations, non-governmental organizations, and civil society.

There are many challenges that developing country actors face in accessing climate finance. They include:

a. the complexity of the climate finance architecture;

b. inadequate infrastructure;

c. political instability, poor governance, macroeconomic policy imperfections, and weak legal systems;

d. lack of capacity in government institutions, accountability, transparency, corruption, and bureaucratic red tape;

e. lack of awareness of what exactly constitutes climate change funding;

f. lack of consistent transparency requirements within the UNFCCC framework;

g. multitude of funding flows and disbursement channels;

h. inconsistent and overlapping criteria for access to funds from different agencies; and,

i. Access to private finance for climate change adaptation depends on a mix of Government policies, regulation, standards, support for new technologies, carbon pricing and improved investment.[378]

Future actions needed include: a) support to governments to create an enabling environment conducive to mobilizing climate finance; b) an institutional and regulatory framework targeted at removing each category of barriers and implemented at different levels; and c) awareness raising and capacity at all levels of government, private sector and civil society.

Criteria for the success of climate adaptation initiatives at the local level

Lessons learned from adaptation to climate change initiatives related to seaweed farming in Zanzibar demonstrate that long-term success of adaptation initiatives at the local level require: a) an enabling environment incorporating economic, social, and institutional factors; b) measures to ensure the success of sustainability of adaptation to climate change; c) given the possibility of the impacts of climate change exacerbating in the medium to long-term, research and investment in new technology; d) training and capacity building for increasing efficiency in the industry; e) greater access to equipment and technology; f) training in managing finances and negotiation with middlemen; g) removing social and cultural barriers for greater empowerment of women; and h) greater engagement of both international and local NGOs and the private sector in providing support to the farmers

There is a significant role for governments to support these initiatives by providing an enabling environment including a sound institutional and regulatory framework. In cultures where there is inequality and gender discrimination, government policy should promote equity where initiatives are implemented by women.

375 Huawei. 2021. Where the Sun Meets the Sea: Offshore Floating-PV Powers Singapore's Journey Toward Carbon Neutrality. Cision. PR Newswire. https://www.prnewswire.com/in/news-releases/where-the-sun-meets-the-sea-offshore-floating-pv-powers-singapore-s-journey-toward-carbon-neutrality-818923100.html

376 Wang, J., & Lund, P. D. 2022. Review of recent offshore photovoltaics development. Energies, 15(20), 7462.

377 Ibid.

378 Lüdemann, C., & Ruppel, O. C. 2013. International climate finance: policies, structures and challenges. In Climate Change: International Law and Global Governance (pp. 375-408). Nomos Verlagsgesellschaft mbH & Co. KG.

List of Acronyms

ABFC	Aquatic Blue Food Coalition
ABMT	Area-based Management Tool
ABNJ	Areas Beyond National Jurisdiction
AC	Adaptation Committee
ACC	American Climate Corps
AI	Artificial Intelligence
AR	Augmented Reality
ASCCR	Association of Southeast Asian Nations State of Climate Change Report
ASEAN	Association of Southeast Asian Nations
BBNJ	Biodiversity in Areas Beyond National Jurisdiction
BCAF	Blue Carbon Accelerator Fund
BCI	Blue Climate Initiative (Section 1.5)
BCI	Blue Carbon Initiative (Section 4.1)
BCI	Blue Carbon Inventory Project (Section 4.1)
BEDF	Blue Economy Development Framework
BNCFF	Blue Natural Capital Financing Facility
BOBP-IGO	Bay of Bengal Programme – Intergovernmental Organization
BOEM	Bureau of Ocean Energy Management
CBD	Convention on Biological Diversity
CCA	Climate Change Adaptation
CCS	Carbon Capture and Storage
CD	Capacity Development
CDR	Carbon Dioxide Removal
CEP	Caribbean Environment Programme
CFP	Common Fisheries Policy
CI	Conservation International
CMA	Parties to the Paris Agreement
CO_2	Carbon Dioxide
COP	Conference of the Parties
DCC	UN Ocean Decade Collaborative Centers
DFI	Development Finance Institution
DOALOS	United Nations Division for Ocean Affairs and the Law of the Sea
DRR	Disaster-risk Reduction
EAS	East Asian Seas
EbA	Ecosystem Based Adaptation
EBCD	European Bureau for Conservation and Development
ECOP	Early Career Ocean Professional
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ETF	Enhanced Transparency Framework
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FOOC	Friends of the Ocean and Climate
G7	Group of Seven
G20	Group of Twenty
GBF	Global Biodiversity Framework
GCF	Green Climate Fund
GDP	Gross Domestic Product
GE-CD	Group of Experts on Capacity Development
GEA	Global Environmental Assessments
GEF	Global Environment Facility
GES	Good Environmental Status
GFCR	Global Fund for Coral Reefs
GGA	Global Goal on Adaptation
GHG	Greenhouse Gases
Global-ONCE	Global Ocean Negative Carbon Emissions
GMA	Global Mangrove Alliance
GO-BC	Global Ocean Decade Program for Blue Carbon
GOF	Global Ocean Forum
GOOD	Global Ocean Oxygen Decade
GST	Global Stocktake
GW	Gigawatt
HLC	High-Level Climate Champions
HSH	His Serene Highness
ICZM	Integrated Coastal Zone Management
IMPAC	International Marine Protected Area Congress
IMO	International Maritime Organization
IMTA	Integrated Multi Trophic Aquaculture
IOC	Intergovernmental Oceanographic Commission
IOI	International Ocean Institute
IPBC	International Partnership for Blue Carbon
IPCC	Intergovernmental Panel on Climate Change
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPOC	International Panel for Ocean Sustainability
ISA	International Seabed Authority
IUCN	International Union for Conservation of Nature
IUU	Illegal Unreported and Unregulated
kWh	Kilowatt-hour
LBS	Land Based Sources of Marine Pollution
LC/LP	London Convention and London Protocol
LCIPP	Local Communities and Indigenous Peoples Platform
LDC	Least Developed Country
LLDC	Landlocked Developing Country
MARPOL	International Convention for the Prevention of Pollution from Ships
MDB	Multilateral Development Bank
MEPC	Marine Environment Protection Committee
MHW	Marine Heatwave
MP-GCA	Marrakech Partnership for Global Climate Action
MPA	Marine Protected Area
MRE	Marine Renewable Energy Resource
MSP	Marine Spatial Planning
MSY	Maximum Sustainable Yield
MW	Megawatt
MWP	Mitigation Work Programme
N_2O	Nitrous Oxide
NAP	National Adaptation Plan
NbS	Nature-based Solutions
NBSAP	National Biodiversity Strategies and Action Plan
NCCAP	National Climate Change Action Plan
NDC	Nationally Determined Contribution
NGO	Non-governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NOP	National Ocean Policy
NORAD	Norwegian Agency for Development Cooperation
NPA	Natural Protected Areas
NPS	Non-Party Stakeholders

NSA	Non-State Actors
NSFCC	National Framework of Strategy on Climate Change
NWP	Nairobi Work Programme
OA	Ocean Acidification
OASIS	Observing Air-Sea Interactions Strategy
OCAP	Climate Policy and Ocean Climate Action Plan
ODA	Official Development Assistance
OMZ	Oxygen Minimum Zone
OTEC	Ocean Thermal Energy Conversion
PA	Paris Agreement
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
POEM	Maritime Space Ordinance Plan
PPP	Public and Private Partnerships
PROREFISH	Climate Resilient Fishery Initiative for Livelihood Improvement in the Gambia
PSHEM	Port Safety, Health, and Environmental Management
REDD	Reducing Emissions from Deforestation and Forest Degradation
ROCA	Roadmap to Oceans and Climate Action
RSP	Regional Seas Programme
SBSTA	Subsidiary Body for Scientific Technological Advice
SDG	Sustainable Development Goal
SDS-SEA	Sustainable Development Strategy for the Seas of East Asia
SEA	Strategic Environmental Assessment
SIDS	Small Island Developing State
SLR	Sea-level Rise
SPAW	Specially Protected Areas and Wildlife
SST	Sea Surface Temperature
STEM	Science Technology Engineering Math
TEC	Technical Executive Committee
UN	United Nations
UNGA	General Assembly of the United Nations
UNEP	United Nations Environment Programme
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCBD	United Nations Framework Convention on Biological Diversity
UNFCCC	United Nations Framework Convention on Climate Change
UNFSS	United Nations Food Systems Summit
UNOC	United Nations Ocean Conference
USD	United States Dollar
VOP	Virtual Ocean Pavilion
VR	Virtual Reality
WACA	West Africa Coastal Areas Management
WEC	Wave Energy Converter
WIM	Warsaw International Mechanism for Loss and Damage
WIO	Western Indian Ocean
WIOMSA	Western Indian Ocean Marine Science Association
ZaSCI	Zanzibar Cluster Initiative

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