



Adaptation of the Ocean, Coastal Areas and Ecosystems

*Scoping Paper on Closing Knowledge
Gaps and Advancing Action*

**A background paper for the
Nairobi work Programme
13th Focal Point Forum
*to be held at COP25, Madrid, Spain***

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An aerial photograph showing a dense green forest on the left, a sandy beach in the middle, and the blue ocean with white waves on the right. The image is used as a background for the document.

Background and context

This scoping paper contains a partnership dialogue on the adaptation knowledge gaps in relation to the ocean, coastal areas and ecosystems, including mega deltas, coral reefs and mangroves as well as slow onset events. It addresses areas of climate change impacts, resilience building and adaptation to climate change. The scoping paper has been prepared in response to the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) mandate to prioritize the thematic area of the ocean under the Nairobi Work Programme (NWP). The scoping paper will serve as background paper for the 13th Focal Point Forum on the topic of oceans that will be held at COP25 in Madrid. A range of activities under the NWP is in progress to advance evidence-based action. The progress made will be reported to Parties for their consideration at SBSTA 52 (May/June 2020).

The NWP established in October 2019 the Specialized Group of Experts on the thematic area of the ocean that provided inputs to the scoping paper and will collaborate in designing the focal point forum as well as co-designing actions in refining and closing knowledge gaps with regard to adaptation beyond the forum. This scoping paper has been prepared with input from the expert group, which includes representatives from: the Intergovernmental Panel on Climate Change (IPCC), the United Nations Development Programme (UNDP), the UN Environment Programme, the Food and Agriculture Organization of the United Nations (FAO), the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO), the World Bank, the United Nations Division for Ocean Affairs and the Law of the Sea of the Office of Legal Affairs of the United Nations (DOALOS), the World Resources Institute / Secretariat High Level Panel for a Sustainable Ocean Economy, the World Ocean Council (WOC), the Global Ocean Forum, the International Union for Conservation of Nature (IUCN), the Nature Conservancy (TNC), Secretariat of the Pacific Regional Environment Programme (SPREP), the Caribbean Natural Resources Institute (CANARI), the Ocean & Climate Platform, the Future Ocean Alliance, the Ocean initiative, Cities Research Institute (Griffith University, Australia) and the University of Pennsylvania.

This scoping paper will serve as an input to the 13th NWP Focal Point Forum that will be held on 6 December 2019 in conjunction with SBSTA 51 at COP 25 in Madrid, Spain. The discussions during the forum will provide an opportunity to refine the scoping paper and provide direction in terms of next steps on this topic in the context of the NWP. The forum will bring together NWP partner organizations, Parties, experts and relevant expert organizations for knowledge sharing and co-designing actions to close knowledge gaps and make action pledges. The findings will be translated into concrete actions to close knowledge gaps on the thematic areas of the ocean and coastal zones, and outcomes will be communicated to all Parties at SBSTA 52 (June 2020).

The objective is to enhance partnerships on the ocean beyond the forum, in order to advance the work in this thematic area by the UNFCCC in 2020. Experts and NWP partners will discuss actions during the forum providing opportunities for co-designing actions and mobilizing support for implementing transformative actions, working with relevant constituted bodies under the Convention, and supporting adaptation and resilient actions at all levels.

Nairobi Work Programme

In order to identify adaptation knowledge gaps in the theme of ocean, coastal areas and ecosystems, to advance activities that produce usable knowledge products and catalyse partnerships for collaborative action with partners and experts, the Nairobi Work Programme Knowledge-to-Action methodology can be applied, as it provides a stepwise approach, including the following steps:

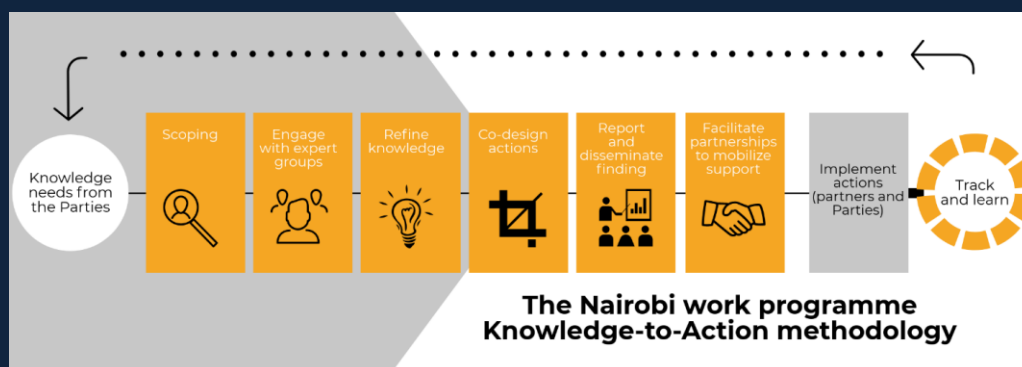


Fig. 1.

- a) **Define knowledge needs:** identify, validate and refine specific adaptation knowledge needs in response to requests from Parties, reformulating them into actionable questions as appropriate;
- b) **Scoping:** review and synthesize existing adaptation knowledge;
- c) **Engage with expert groups:** identify relevant experts and engage them by forming a specialized group to advance work on specific issues or themes;
- d) **Refine knowledge:** identify key principles, good practices and priority knowledge gaps;
- e) **Co-design actions:** develop actions together with expert groups, partners or constituted bodies to address knowledge needs and enhance national, regional and local adaptation actions;
- f) **Report and disseminate findings:** repackage knowledge into a usable format for policymakers, non-Party stakeholders and general audiences;
- g) **Facilitate partnerships:** foster partnerships through expert groups, including with Parties and NWP partners, to mobilize support for implementing transformative actions and to close knowledge gaps;
- h) **Track and learn:** document and report outcomes to Parties, in partnership with expert groups. Outcomes to be reported to Parties could include an overview of actions to close knowledge gaps (status, outputs and impact in response to Parties' needs) and updated adaptation knowledge and knowledge gaps on specific issues and themes. These outcomes could then be used to derive specific lessons, update knowledge needs and improve interventions and actions.

1. Introduction

The Ocean as a foundation of resilience: The ocean and all ecosystems composing it are the foundation for resilient life on earth. The ocean host vast reservoirs of biodiversity and provide crucial services to human well-being, such as global food security and the blue economy. Over a billion people worldwide depend on fish as a source of protein, over three billion people depend on marine and coastal resources for their livelihoods, and all seven and half billion people on the planet depend on the ocean for half of the oxygen they breathe. The ocean serves large parts of the world's economy, supporting sectors including tourism, international shipping, mineral resource extraction and renewable energy. Some national economies and prosperity mostly depend on ocean economy, especially in Small Island Developing States and low-lying delta countries. Economic activity in the ocean is expanding rapidly and is projected to double its contribution to global economy in 2030 on a “business-as-usual” scenario-basis, reaching conservatively over USD 3 trillion¹. Marine and coastal resources are particularly important for livelihoods of poor and vulnerable coastal communities. In addition to the role the ocean plays in economies, the cultural importance of the ocean is also recognised².

Oceans regulate the climate system and are profoundly affected by it: The ocean is the primary driver and regulator of the global climate, storing 93% of the heat generated by industrial-era CO₂ emissions, and the world's largest carbon sink, absorbing 25% of anthropogenic CO₂ emissions to date. In turn, the ocean is increasingly affected by the rise in CO₂ concentration, which leads to water acidification and changes the chemical composition of the ocean. Global warming is causing rising ocean temperatures, decreasing Arctic and Antarctic sea ice extent, and a loss of oxygen increasing dead zones. These impacts and associated extreme and slow-onset events inflict havoc on marine ecosystems, coastal areas and human societies. The IPCC has published in 2019 the Special Report on the Ocean and Cryosphere in a Changing Climate³ (SROCC), which identifies a number of ocean-climate linkages, including the role of the ocean in regulating the global climate, mediating global temperature, and its relation with living ecosystems and human communities. Based on projections, over the 21st century, changes in the ocean will continue and intensify:

¹ The Organisation for Economic Cooperation and Development (OECD) “Ocean Economy in 2030” (2016)

² <https://www.iucn.org/news/commission-environmental-economic-and-social-policy/201710/raising-and-integrating-cultural-values-ocean>

³ The Intergovernmental Panel on Climate Change (IPCC) “Special Report on the Ocean and Cryosphere in a Changing Climate” (2019)

temperatures will increase, global mean sea level will continue to rise as glacier mass loss and ocean thermal expansion endure, the ocean will continue to lose oxygen and to acidify. Increases in cyclonic winds and rainfall, extreme marine waves, combined with sea level rise, will exacerbate extreme sea level events, coastal hazards and disaster impacts.

1.2. Inadequate stewardship of oceans magnifies climate impacts and risks: These climate change impacts act as threat multipliers by combining with other anthropogenic impacts, such as unsustainable coastal development, overexploitation of living marine resources, habitat alteration and pollution, thus exacerbating challenges relating to food security, livelihoods and the development of communities. The cumulative effects of these impacts may cause changes at a pace such that marine ecosystems and species would not have sufficient time to adapt.⁴ Taking into account rapid economic development, the impacts of climate change, the historic and ongoing marine biodiversity over-exploitation and degradation, the long-term stabilizing effects of the ocean, its functionalities and capacity to provide ecosystem services are threatened, as well as the human communities depending on them. A multi-stressed and rapidly changing ocean is not inexhaustible anymore. Questions about the coping capacity of the oceans with the long-term stabilising effects and the socio-economic gains that it can yield, are being raised⁵. In fact, the findings of the First World Ocean Assessment indicate that the oceans' carrying capacity is near or at its limit.⁶

1.3. Oceans play a central role in adaptation potential: The ocean economy and related ecosystem services are estimated at USD 3-6 trillion annually, and with more than 10% of the world's population living in coastal areas that are less than 10 meters above sea level highlighting the importance of protection of these marine and coastal areas for the economy.⁷ Considering that heavy concentrations of population and economic activities are along coasts and is expected to continue to rise, coastal areas especially in the most vulnerable low-lying islands, coastal ecosystems, deltas and coastal cities are in a particular need of proactive action to adapt and build resilience to climate change. Slow onset events (including sea level rise, increasing temperature, ocean acidification, glacial retreat) and related impacts, and rapid onset events (including storm surges) are sources of hazards to the ecosystems, fisheries, tourism and people, which in the coastal zone are exacerbated by additional factors, such as compound floods and coastal land subsidence. The SROCC highlights that emission reductions are crucial and that adaptation measures can generate many co-benefits at different scales, but warns that some adaptation solutions could reach their limits if climate change is not sufficiently mitigated. The SROCC stresses the importance of how the ocean and coastal ecosystems can play a key role in helping

Coastal adaptation provides numerous economic and social benefits for the coastal communities by protecting infrastructure and communities from damage. Implementation of adaptation technologies can benefit ecological systems (especially by building solutions with nature), but it can also have negative impacts on biodiversity. The benefits can be maximized by use of nature-based solutions and proactive implementation.

⁴ Report of the Secretary-General on Oceans and the Law of the Sea, A/72/70, on "The effects of climate change on oceans", paras 8 and 32

⁵ OECD 2016

⁶ <https://www.un.org/regularprocess/content/first-world-ocean-assessment>

⁷ Innovative Finance for Resilient Coasts and Communities. UNDP and TNC. (2018) www.nature.org/content/dam/tnc/nature/en/documents/Innovative_Finance_Resilient_Coasts_and_Communities.pdf

communities adapt to climate change, as well as the importance of protecting and ensuring the resilience of ecosystems from climate change.

1.4. Importance of adaptation knowledge: The ocean is becoming an increasingly important part of the climate change conversation under the UNFCCC⁸. Urgency to act is emphasized with the need to share knowledge and good practices in order to leverage, accelerate and upscale the needed interventions for coastal adaptation and resilience building. There, however, exist knowledge gaps, which may hinder development of adaptation and resilience building strategies by the countries and regions. Limited knowledge on prevention and resilience building can especially affect least developed countries (LDCs) in low-lying areas and SIDS that are more vulnerable and of the lower resilience of the rural communities to the impacts of disasters. Likewise, women and Indigenous Peoples in these areas are still underrepresented in resilience building and adaptation efforts and decision-making, despite being among the most vulnerable to the impacts of climate change⁹. In view of importance of sharing knowledge and practices more systematically, this Scoping Paper presents the adaptation practices with good practices, knowledge gaps and needs, which have been identified with the assistance of the NWP/UNFCCC Specialized Group of Experts on Oceans preceding the 13th Focal Point Forum.

This document presents an overview of good practices and briefly addresses knowledge gaps, needs, and needed actions. More information, including more details and a bigger variety of good practices, will be presented in the supplementary document-annex: *'Additional Information'*.

⁸ Article 4.1.

⁹ <https://www.un.org/development/desa/indigenouspeoples/climate-change.html>



2. Global Ocean Actions

2.1. The role of the UNFCCC

The ocean is becoming an increasingly important part of the climate change conversation under the UNFCCC in light of unprecedented climate change impacts on the oceans and coastal areas and with growing need of the countries to prepare for an uncertain future. The UNFCCC recognizes the importance of the ocean and adaptation, and the challenges required for actions¹⁰. In order to bring more evidence and discussion about the ocean in climate policy arena, the UNFCCC has initiated the dialogue with governments. Under the UNFCCC process, governments agreed to undertake concrete activities addressing the ocean, coastal areas and ecosystems to inform adaptation planning and actions at the regional, national and subnational level.

The Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UNFCCC has identified that systematic observation and research is needed to fully understand the role of the ocean in climate change, predict changes, determine risk and appropriate action. The SBSTA is further mandated, under the Research and Systematic observation agenda item, to encourage Parties to support the Global Climate Observing System (GCOS), invest in systematic observation and research of the ocean. Under the Marrakech Partnership for Global Climate Action (GCA), ocean and coastal zone are a key theme of the UNFCCC global climate action agenda, which has provided a platform for stakeholders to collaborate on ocean and climate change action.

At SBSTA 48 (May 2018), the SBSTA concluded that future Nairobi Work Programme on impacts, vulnerability, and adaptation to climate change (NWP) thematic areas should focus on emerging issues in relation to climate change including: oceans, coastal areas and ecosystems, as well as mega deltas, coral reefs and mangroves¹¹. The SBSTA 50 (June 2019) mandated several actions under the thematic area of oceans. One of the thematic areas for the Nairobi Work Programme in 2019 is on the ocean, including the focal point forum at SBSTA 51 (December 2019). The progress made will be reported to

¹⁰ Article 4.1.

¹¹ FCCC/SBSTA/2017/7 paragraph 21.

Parties for their consideration at SBSTA 52 (May/June 2020). A range of activities under the NWP is in progress to advance action through knowledge in this thematic area. Moreover, the work programme of the Warsaw International Mechanism on Loss and Damage (WIM) currently addresses ocean issues, which include both slow and rapid onset events, non-economic losses and irreversible impacts (e.g. coral bleaching). The Executive Committee of the WIM are working with the Technology Executive Committee (TEC) to prepare a policy brief on technology to avert, minimize and address loss and damage in coastal zones¹², that will be presented to Parties at SBSTA 52.

The majority of the National Adaptation Plans (NAPs) submitted to the UNFCCC Secretariat to date, included projects on ocean and coastal zones. Over 70% of current Nationally Determined Contributions (NDCs) mention ocean-related topics with the dominant issues being: coastal impacts, ocean warming impacts, fisheries impact, ocean research and marine ecosystem impacts.¹³

2.2. Global agendas

In the context of the sustainable development agenda, the final document of the Rio+20 Summit, *The Future We Want*, made extensive reference to the ocean, expressing concern about its rapid degradation and unsustainable use. The 2030 Agenda for Sustainable Development includes a specific goal on the conservation and sustainable use of the ocean (SDG14: Life Below Water), the implementation of which was addressed at the first high-level United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development (UN Ocean Conference), held in 2017 at United Nations Headquarters in New York. Since 2006, the United Nations General Assembly (UNGA) in its annual resolutions on "Oceans and the law of the sea", has also continued to draw attention to the need to address the impacts of climate change and ocean acidification on marine ecosystems.¹⁴ It has encouraged States to enhance scientific activity and support marine scientific research to better understand the impacts of climate change on oceans and seas as well as ocean acidification, and develop ways and means of adaptation. It has further called for enhanced international cooperation and capacity-building to support research activities. The United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea in May 2017 focused its discussions on "The effects of climate change on oceans".¹⁵ This was the first time that this issue of global concern and its implications in terms of loss of life, loss of territory, destruction of property, erosion of coastlines, migration of fish stocks, coral bleaching and other ecosystem degradations, was discussed by an intergovernmental forum in a cross-sectoral manner.

Within the overall legal framework set out in the United Nations Convention on the Law of the Sea (UNCLOS), which sets out the regime for maritime zones and all activities taking place in the ocean and seas, and related instruments, the global frameworks for sustainable development (including the 2030 Agenda for Sustainable Development, the Addis Ababa Action Agenda, the Aichi Biodiversity Targets), for climate actions (including the Paris Agreement, adopted under the UNFCCC, and SDG 13: Climate Action) and for Disaster Risk Reduction (including the United Nations Office for Disaster Risk Reduction (UNDRR) and the Sendai Framework for Disaster Risk Reduction) underline a combination

¹² FCCC/SB/2017/1/Add.1, FCCC/SB/2018/1.

¹³ <https://escholarship.org/content/qt5255342w/qt5255342w.pdf>.

¹⁴ Relevant resolutions of the General Assembly are available at:
https://www.un.org/Depts/los/general_assembly/general_assembly_resolutions.htm

¹⁵ See report of the meeting at A/72/95.

of needs for responses to climate change impacts. In terms of institutional set up, the ocean is addressed by a number of United Nations agencies, funds, programmes and departments,¹⁶ which are mandated to provide support to States in managing, protecting, conserving and restoring coastal areas and marine ecosystems, including through policy guidance and by developing the capacities of States in climate change adaptation and coastal hazards preparedness.

The first UN Ocean Conference (June 2017) in its “Our ocean, our future: call for action” called for integrated, interdisciplinary and cross-sectoral approaches to ocean governance, as well as enhanced cooperation, coordination and policy coherence at all levels are needed, including in the development and implementation of effective adaptation measures that contribute to enhance ocean and coastal resilience and better conserve and sustainably use marine biodiversity. For this purpose, (1) effective partnerships enabling collective actions with the full participation of all relevant stakeholders are underlined, as well as (2) the importance of enhancing marine scientific knowledge and research to inform and support decision-making, including the promotion of knowledge hubs and networks to enhance the sharing of scientific data and best practices¹⁷. In this context, the UNGA proclaimed the United Nations Decade of Ocean Science for Sustainable Development (2021-2030) to contribute to achieving the ocean-related SDGs, by transforming knowledge systems to support sustainable development. As mandated by the UNGA, the Intergovernmental Oceanographic Commission (IOC) of UNESCO coordinates the Decade’s preparatory process (2018-2020), inviting the global ocean community to plan for the next ten years in ocean science and technology. In addition, the UNGA has decided that, building on the baseline study of the state of the world’s ocean provided by the first World Ocean Assessment, the second World Ocean Assessment, to be released in 2020, will extend to evaluating trends and identifying gaps.¹⁸ The second UN Ocean Conference will be held in June 2020 in Lisbon, Portugal, co-hosted with Kenya. The overarching theme of the Conference is “Scaling up ocean action based on science and innovation for the implementation of Goal 14: stocktaking, partnerships and solutions”.¹⁹

2.3. Other Ocean Initiatives and Partnerships

In the last several years, a number of ocean initiatives at global, regional and national levels have been launched in support of ocean action. These include²⁰: the *Because the Ocean* initiative, the Ocean and Climate Initiatives Alliance, the Ocean Pathway Partnership, the Global Ocean Forum, the International Ocean Acidification Alliance, the Ocean and Climate Platform, Friends of Climate and Ocean, the High-level Panel for a Sustainable Ocean Economy, the Marine Regions Forum, the UN Global Compact’s Sustainable Ocean Principles, Blue Prosperity Coalition, EU-China Ocean Partnership, The Blue Carbon Initiative, International Partnership for Blue Carbon, #VirtualBlueCOP, WOC’s Sustainable Ocean Summit, The Economist Group’s World Ocean Initiative, and the IOC-UNESCO and European Commission’s Joint Roadmap to accelerate Marine Spatial Planning (MSP) processes worldwide including the MSP global Initiative, the Delta Alliance. Agendas framing “ocean economies” and “blue economies” are also significant. The Organisation for Economic Co-operation

¹⁶ The list of UN-Oceans members provides an overview of the UN system organizations with a mandate related to oceans 9the UNFCCC Secretariat joined UN-Oceans in 2018), see <http://www.unoceans.org/about/en/>.

¹⁷ General Assembly resolution 71/312.

¹⁸ General Assembly resolution 70/235.

¹⁹ General Assembly resolution 73/292.

²⁰ The more detailed list is provided in the Additional Information document, published online on the NWP website.

and Development (OECD) has focused on ocean activities in two reports: “Ocean Economy” (2016) and “Rethinking Innovation for a Sustainable Ocean Economy” (2019). The recent reports by the international organisations underline uptake of heat and CO₂, and the consequences of climate change on ocean ecosystems. Regional and national initiatives are taking place, e.g. in Caribbean and Pacific SIDS, to promote “blue economy” approaches which promote principles of sustainability, inclusiveness and resilience in economic development based on the use of ocean resources. An example of the evolution of one of these initiatives can be seen through the Ocean Pathway Partnership (OPP)²¹, which worked with Parties to establish a “Friends of the Ocean” process that aims to provide a safe space for Parties to discuss, debate and implement the various options for the ocean in the UNFCCC starting in Bangkok (2018) and in each UNFCCC conference until 2020. The OPP also has played a role in helping to raise awareness of the ocean in existing processes within the UNFCCC and for a healthy and sustainable ocean action within in the Global Climate Action agenda and other venues.

²¹ <https://cop23.com.fj/the-ocean-pathway/>



3. Ocean Issues: Knowledge gaps, uncertainties and needs

With regards to knowledge of ocean and climate change interaction, there are uncertainties and knowledge gaps across bio-physical to social, economic and technical ocean issues. These uncertainties and knowledge gaps significantly affect adaptation knowledge. Some examples of these issues are included in the table below:



Ocean warming

Limited knowledge about global ocean heat inventory leads to large uncertainties in: Weather forecasts and predicting the possible impacts of hydro-meteorological extremes; Long-term impacts of ocean warming and adaptation capacity of species and ecosystems. There are still gaps in the observations as well as the development of a cause and effect understanding of the impacts and risks caused by climate change including all relevant dimensions at ecosystem, social, and economic levels. Along these lines there are gaps in understanding vulnerabilities of species, ecosystems and societies as well as in both ecosystem and species level adaptation science, and its relation to be able to inform management and governance issues, such as on coral reefs and fisheries. For ocean warming and other drivers this concerns the identification of adaptation limits and the capacities of ecosystem and human systems to adapt. Joint international efforts in monitoring the temperature of the global ocean and having improved *in situ* data on ocean surface water temperature and top layer mixing is key to reduce the still large uncertainties and to predict long-term impacts.



Extreme Weather Events

The uncertainty of changes in wind fields and extreme wind statistics in future climate exist partly due to imperfect representation of the interaction between the ocean and the atmosphere in global and regional climate models. Air-sea fluxes of energy, momentum, carbon, moisture are relatively poorly known due to uncertainties in winds, waves and currents. Although there is an effort to generate wave climate statistics and projections and aid comprehensive assessments of their cascading uncertainty through the Coordinated Ocean Wave Climate Project (COWCLIP)²², there are still limited databases on wave climates, with data missing/needed largely for spatial coverage outside the territorial waters, and in the polar areas. Long-term monitoring of winds, ocean currents and waves at global and local scales is needed for extending databases, as well as closer collaboration between the disciplines of meteorology and oceanography. Here, gaps of knowledge exist with respect to thermal stress events such as marine heatwaves and their impacts including the resilience of marine species and ecosystems to changes in the frequency, intensity and duration of marine heatwaves. This concerns the identification of adaptation limits and the capacities of ecosystems and human systems to adapt. Increased ocean observations are needed and continued research on how NBS actions can help reduce risks arising from storm surges. Also: a need to better understand the impact of extreme weather events on human communities in coastal regions, including sex-disaggregated data on those displaced, injured and killed during and after extreme weather events.



Sea Level Rise

The largest uncertainty is related to the onset of instability of the ice sheets in Greenland and Antarctica, which has the potential to increase and accelerate sea level rise by several metres within a few centuries. Sea level rise is not uniform globally and knowledge gaps exist for understanding of regional sea level changes in coastal regions where a variety of climate and non-climate related processes interact. Sea-level rise will have large implications for the risks from coastal hazards including flooding and coastal erosion of low-lying and densely-populated coastal areas and ecosystems, deltas, and the ocean islands. Regional and local sea level rise information is important for the design of the national climate adaptation strategies. The importance of global ocean observations is high to monitor the contributions from thermal expansion, circulation and mass distribution to address uncertainties. Also, a coordinated construction of regional sea level rise scenarios with other countries bordering basins may generate increased support for knowledge and national activities and integration of governance arrangements. The response of coastal ecosystem to sea level rise including protecting and restoring ecosystems such as mangroves, monitoring of sediment supplies and ecosystems, is needed. This also concerns the identification of adaptation limits and the capacities of systems to adapt.

²² An international collaborative research project, being a component of the work-plan for the JCOMM Expert Team on Waves and Coastal Hazards; https://www.jcomm.info/index.php?option=com_content&view=article&id=275&Itemid=37 ; <https://www.nature.com/articles/s41558-019-0542-5>



Ocean Acidification

The oceans pH is decreasing as a consequence of uptake of anthropogenic, atmospheric CO₂ by the ocean with consequences for many organisms living in the ocean. Polar ecosystems may be at particular risk. In coastal and shelf oceans shallow seas are under bigger risk than the open ocean, because local processes such as precipitation run off, coastal modification leading to changes in hydrological cycles, and eutrophication significantly affect pH; management of these activities offers opportunities for adaptation and conservation. The impact of pH changes on the organismal and ecosystem level is not monitored sufficiently or consistently across geographies, while it is important to develop a cause and effect understanding through identifying the physiological and biochemical mechanisms and understand the higher level ecosystem responses to ongoing acidification as well as improving projections of future changes and risks including irreversible shifts in ecosystem structure and functioning. Ocean pH monitoring as well as the monitoring of impacts is needed as ocean acidification affects the overall ecological state of ocean regions, with the potential to affect all trophic levels. This also concerns the identification of adaptation limits and the capacities of ecosystems to adapt.



Ocean deoxygenation

Ocean warming and the associated stratification of ocean waters cause an average decline in oxygen content which has consequences for temperature dependent biogeography and suitability of species' habitat. The associated vulnerabilities and impacts lead to shifts in the productivity of species, their interactions and the composition of ecosystems. Monitoring of ocean oxygen and the understanding of adaptation capacities of species to such conditions is insufficient and thus consequences for ecosystem structures in diverse systems across latitudes unclear. This also concerns the identification of adaptation limits.



Responses to multiple drivers

Ocean warming, acidification and deoxygenation jointly impact marine life, the interaction of these drivers needs monitoring as it may also affect adaptation limits of species and the capacities of systems to adapt; these need to be identified from field observations and experimental studies.



Harmful algal blooms (HAB)

Harmful algal blooms (HABs) have shifted ranges and been occurring at increased frequency in coastal waters with impacts for ecosystems, aquaculture and human health. HABs are exacerbated by eutrophication of coastal waters. Sustained monitoring systems and early warning systems will reduce risks to industry and people.



Sargassum

Since 2011, sargassum has been accumulating in the equatorial Atlantic, and huge volumes are periodically transported by ocean currents to Caribbean. These unprecedented and hard-to-predict influxes of sargassum, linked to ocean eutrophication and climate change, are having devastating impacts on Caribbean coastal socio-ecological systems. Research is currently underway to better understand the causes.



Freshening of high latitude waters

The freshening of Arctic surface waters and may have consequences for the dynamics of large-scale ocean circulation systems such as AMOC and their projected slowing under climate change. In the coastal and delta areas, it has an impact on coastal agriculture practices.



Redistribution of marine biodiversity

Evidence shows that species are redistributing in every ocean basin. Modelling projections indicate a wide redistribution of marine life with local extinctions prevalent in equatorial regions. Research to understand the consequences for ecosystem structure and functioning and for marine conservation and fisheries is needed. This also concerns the identification of adaptation limits and the capacities of systems to adapt. Migration of fish stocks under future climate scenarios impact food supply and fishing rights.

Observed regional impacts from changes in the ocean and the cryosphere

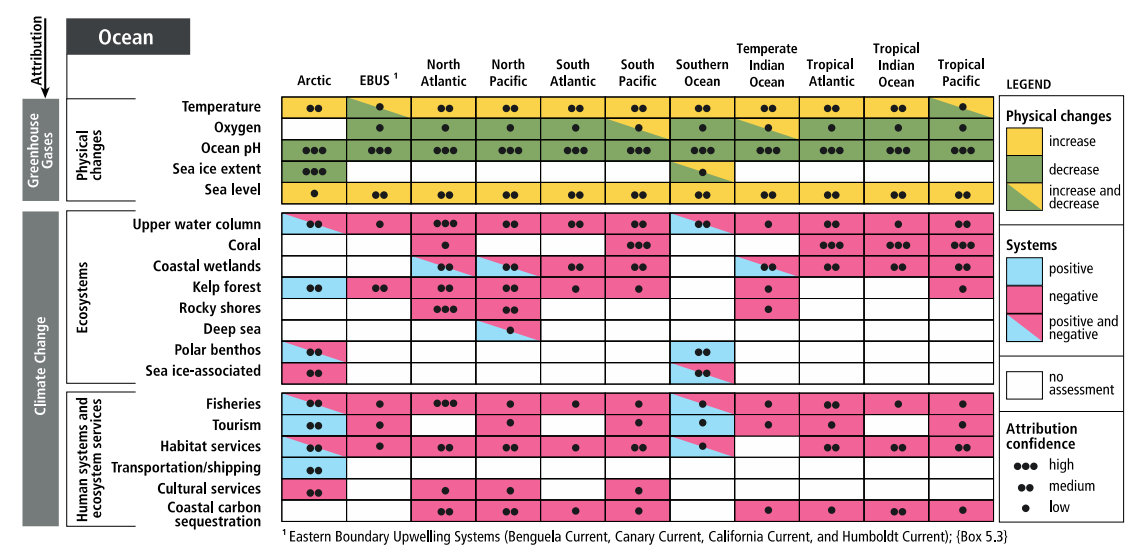


Fig. 2.

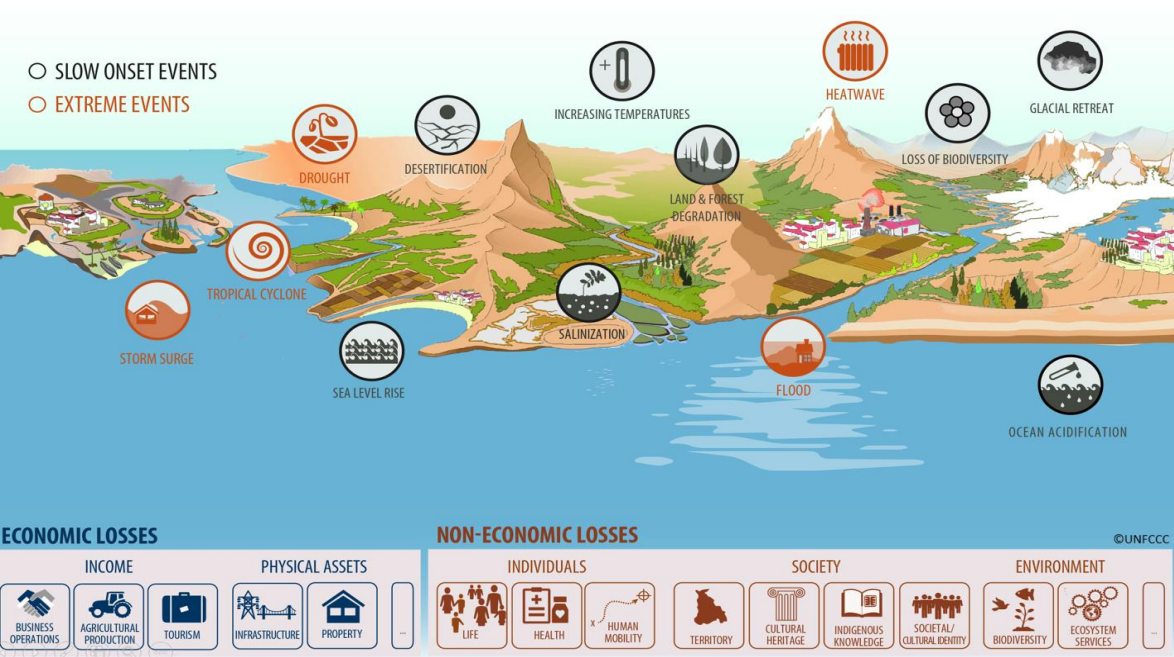


Fig 3. Loss and damage associated with the impacts of climate change, Warsaw International Mechanism for Loss and Damage





4. Existing Knowledge, Practices and Projects

The United Nations programmes, such as UNDP and UN Environment, and the regional bodies, such as the European Commission for the European Union, provide funding, human, technical and technological support to countries in order to strengthen adaptation knowledge and resilience to climate-related hazards. Within the UN Climate Change regime, Parties carry out adaptation-related activities in a number of work streams, through work programmes and in specialized groups and committees. Implementation takes place at various levels, including national and sub-national, and through different means, including projects, programmes, policies or strategies. The regional and local initiatives, programmes and projects, and the international donors further strengthen these climate adaptation efforts around the world. For example, United Nations programmes, such as UNDP and UN Environment, and the regional bodies, such as the European Commission for the European Union, provide funding, human, technical and technological support to countries in order to strengthen adaptation knowledge and resilience to climate-related hazards.

The section provides an overview of adaptation planning efforts at different governance, funding efforts to support adaptation, various adaptation technologies and measures, and example of adaptation actions and projects in different regions of the world.

4.1 Adaptation Efforts Related to the Ocean

Modes of Adaptation Planning

Implementing actions to adapt to climate change in marine and coastal areas occurs on the regional, national and sub-national scales. National authorities and regional bodies have considered climate change impacts and escalating socioeconomic costs on coasts (IPCC 2007), and climate adaptation has become a key consideration in many coastal management plans for over a decade.

Regional Approaches and the Ocean

The Regional Seas programmes identified climate change as one of the strategic themes to be addressed (2017-2021) with several of them already having developed regional strategies to address climate change, e.g. the Contracting Parties to the Barcelona Convention adopted a Regional Climate Change Adaptation Framework for the Mediterranean Marine and Coastal Areas. The European Union is an example of a group of countries providing support to broad coastal adaptation efforts on the regional scale. The European Commission Directorate-General DG Environment supported implementation of sustainable and adaptive coastal management in Europe through various initiatives, including OURCOAST²³ (2008-2011), where the adaptation to risks and the impacts of climate change, sustainable use of resources and sustainable economic growth were key themes in the 350 coastal best practices collected from Europe. These good practices now constitute the European Climate Adaptation Platform (Climate-ADAPT)²⁴, the European Commission Directorate-General for Climate Action) database of experiences, which enhances the preparedness and capacity of all governance levels to respond to the impacts of climate change.

The launch of the Action Plan for Healthy Oceans and Sustainable Blue Economies for the Asia and Pacific region by the Asian Development Bank, one of the latest regional initiatives, is a call for action in light of ocean ecosystems being pushed to the brink of collapse by the threats of climate change, pollution, and illegal and unregulated fishing. Regional approaches in SIDS are particularly important, for example development of the Caribbean Community (CARICOM) Regional Framework for Achieving Development Resilient Climate Change (2009-2015). The 10-year Strategic Action Programme for the Sustainable Management of the Shared Living Marine Resources of the Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME+ SAP) identifies threats from climate change as a cross-cutting issue.

In the Pacific, there are several regional initiatives that participate to improving coastal adaptation. One of the key landmark frameworks is the Framework for Resilient Development in the Pacific (FRDP). This regional framework provides high-level strategic guidance to different stakeholder groups on how to enhance resilience to climate change and disasters, in ways that contribute to and are embedded in sustainable development. It includes guiding elements on how to improve the resilience of coastal areas to climate change. Furthermore, the Pacific Blue Shipping Partnership (PBSP), co-chaired by the Governments of Fiji and the Marshall Islands with the support of the Governments of Samoa, Solomon Islands, Tuvalu, Vanuatu and open to others, aims to reduce Pacific countries' carbon dioxide (CO₂) emissions from shipping by 40% by 2030, with the aim of achieving complete decarbonization by 2050. To achieve this goal, the Partnership is seeking USD 500 million to retrofit existing cargo and passenger ferries with low-carbon technologies and to buy zero-emission vessels. At their meeting in September 2019, Transport Ministers also adopted Pacific Ports 2030-2050, a vision of Resilient, Green and Clean Ports in the Pacific.

Innovative methodologies and approaches to marine and coastal management have been developed for linking together regional and local approaches to climate change and coastal adaptation, both to influence policy setting in relevant institutions and to reinforce/strengthen policy as a driver in local settings.

Linking the Regional and Local Approaches

²³ <https://op.europa.eu/en/publication-detail/-/publication/d1e5dfcb-16d7-4ddc-89b1-a92ec9844018>

²⁴ <https://climate-adapt.eea.europa.eu>

In the North-West Europe region, Coastal Adaptation EU²⁵, launched by the Innovative Management for Europe's Changing Coastal Resource project (IMCORE²⁶ 2009-2011, funded under the EU Interreg IVB Programme) delivered a plan to adapt to coastal climate change with coastal adaptation strategies that allow for practical implementation for coastal communities and economies. It produced tools and methodologies for the coastal adaptation strategies, local strategic adaptation guidance, advanced institutionalization of coastal adaptation, and it has successfully enhanced capacity.

In the Pacific, the Regional Technical Support Mechanism (RTSM) is a registered network of pre-approved experts (e.g. on gender, climate change financing, knowledge management, monitoring and evaluation etc) that can provide, on the request of Pacific Island Countries (PICs), advice on appropriate resource opportunities, strategic approaches and technical assistance on climate change, as linked to food security and infrastructure. They also provide where necessary, support in developing project concepts and proposals, preparing reporting requirements and implementing and monitoring projects. The RTSM facilitates the Pacific's rapid access to technical and advisory services and in the process, create or strengthen national capacity to effectively respond to climate change and disaster risk reduction.

Increasing awareness of climate change adaptation issues and the need for policy makers and managers to include climate change adaptation actions in all their planning measures are being recognized worldwide by governments and coastal communities. In 2009, the United States developed a guidebook on adapting to coastal climate change²⁷ that provided an approach for assessing vulnerability to climate change, developing and implementing adaptation options, and integrating options into programs, development plans and projects at the national and local levels. Other national and subnational efforts take place globally with countries developing adaptation approaches and actions.

About 70% of the 161 NDCs submitted by June 2016 included some mention of marine issues²⁸, where marine issues were most frequently included as components of adaptation action or with regard to climate impacts. Over a third of submitted NDCs also included ocean-related mitigation measures, largely relying on blue carbon ecosystems absorbing CO₂ and storing carbon in sediments (i.e. mangroves, saltmarshes and seagrasses), but also through various actions to reduce greenhouse gas emissions (i.e. changes in fisheries and ecosystem management, maritime transport and ocean renewable energy production). 112 countries included the ocean in their NDCs (representing 73% of the 2019 global population). Several Parties with large coastal regions and Exclusive Economic Zones, e.g. Australia, Brazil, the European Union, Micronesia, New Zealand, Norway, the Russian Federation, and the United States, did not include any explicit reference to marine ecosystems within their NDCs.²⁹

Funding and Financial Capacities to support Adaptation

The World Bank, the Asian Development Bank (ADB), the European Regional Development Fund (ERDF), the African Development Bank (AfDB), the Caribbean Development Bank (CDB) and other international donors fund climate adaptation and building resilience efforts in developing countries and regions that contributes to generating adaptation knowledge. International climate finance is

²⁵ <http://www.coastaladaptation.eu/index.php/en/>

²⁶ <http://www.imcore.eu>

²⁷ US guidebook on adapting to coastal climate change (2009) USAID, CRC, NOAA in partnership with URI-CRC and IRG

²⁸ Gallo et al., 2017

²⁹ Gattuso, J.-P. et al. (2019). Opportunities for increasing ocean action in climate strategies. IDDRI, Policy Brief N°02/19.

being scaled up by international climate funds focusing on adaptation, including the Green Climate Fund (GCF), the Adaptation Fund, and the Special Climate Change Fund. These funds serve as an additional source of funding to support developing countries in achieving a paradigm shift to low-emission and climate-resilient pathways.

Examples of loans, bonds, insurance, multilateral and bilateral funds in adaptation related to the ocean:

- In Egypt, the Green Climate Fund (GCF) and UNDP co-fund the Enhancing Climate Change Adaptation in the North Coast and Nile Delta Regions in Egypt Project (ECCADP)³⁰ that aims at supporting the adaptation efforts of Egypt in the North coast and the Nile Delta by integrating additional risks of climate change into coastal management and planning, budgeting and implementation of risk reduction measures.
- Problue Program³¹ is a new umbrella multi-donor trust fund, housed at the World Bank, that supports the sustainable and integrated development of marine and coastal resources in healthy oceans, including pillars: 1-fisheries and aquaculture, 2-marine pollution, 3-oceanic sectors, 4-integrated seascapes, through which the sustainable and integrated development of economic sectors in healthy oceans is promoted.
- The Caribbean Climate Smart Accelerator is another example, involving collaboration among CARICOM, OECS, IDB, GFDRR and Virgin Unite.
- Innovative approaches for international financing options for adaptation: Blue Bonds can provide countries with resources for improving fisheries management, improving coral reef management, and ecosystem-based adaptation to climate change in a holistic fashion. In 2018, the Government of Seychelles announced the issuance of the world's first sovereign Blue Bond partially guaranteed by a US\$5 million guarantee from the World Bank (IBRD) and further supported by a US\$5 million concessional loan from the GEF. Through the Seychelles' Conservation and Climate Adaptation Trust (SeyCCAT), a portion of the proceeds from the bond will help pay for marine protection, fishery management and other projects to safeguard the ocean economy that the country depends on.
- Emerging innovative financing opportunities for adaptation and specifically, ecosystem-based adaptation are now emerging within the insurance sector. E.g.: the InsuResilience Global Partnership details that the insurance industry could be investors in EbA, where "(re)insurers invest in social impact bonds or green bonds that include actions to conserve and restore ecosystems for their financial returns and their benefits to society."
- New facilities like the Blue Natural Capital Financing Facility (BNCFF) emerged. The BNCFF provides funding for bankable projects and businesses with clear climate change adaptation and/or mitigation impacts that include NbS in the coastal area. The goal is to leverage private investment opportunities into sustainable climate projects building on or including nature-based solutions, as they are still very rare.
- The importance of bilateral and multi-lateral funds is to be noted. Financial assistance from developed countries provides significant support in adaptation knowledge in developing countries and regions, usually with a thematic focus, such as, but not limited to: Germany co-

³⁰ <https://www.greenclimate.fund/projects/fp053>

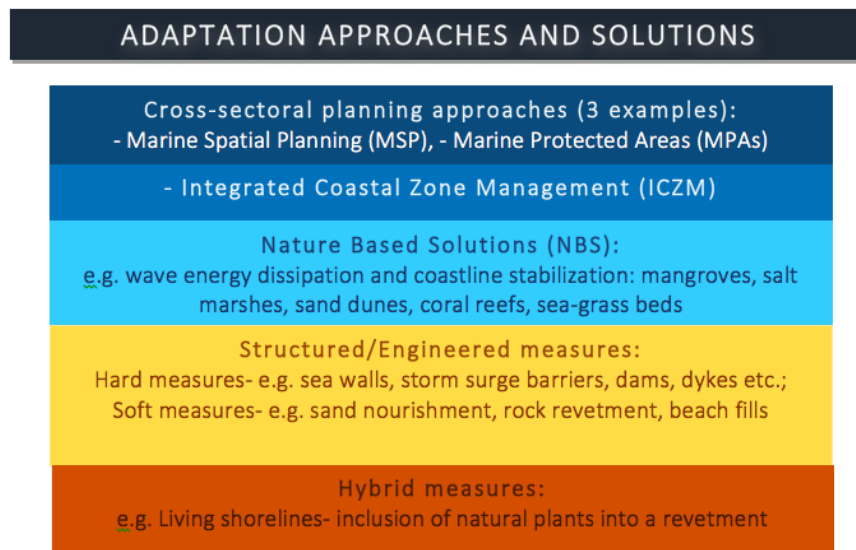
³¹ <https://www.worldbank.org/en/programs/problue>

finances ocean governance projects and initiatives, France committed a grant to the World's Blue Action Fund to support efforts to conserve ocean and coastline, the Netherlands co-finances delta development plans (adaptive delta management e.g. in Benin and Bangladesh), and Norway-Liechtenstein-Iceland contribute to the EEA Grants for Climate Change and Blue Growth.

- In addition, some private sector funding also exists as corporate funding for civil society action.

4.2 Adaptation practices related to the ocean

In pursuit of sustainable development and adaptive management, ecosystem-based approaches to ocean and coastal areas management are used. National and jurisdictional processes that encompass an ecosystem-based approach could include, but not limited to, Integrated Coastal Zone Management (ICZM), Marine Spatial Planning (MSP), and Marine Protected Areas (MPAs). The last two decades have seen a rapid increase in interest and action at varying political levels to implement these approaches. Coastal and marine ecosystem management plans with respect to climate adaptation are considering the importance of integrating a long-term planning horizon as well as cost-effective adaptation measures such as nature-based solutions (NBS). Examples of prevailing approaches and emergent developments are presented in this section, as well as techniques of implementation:



Integrated Coastal and Marine Adaptation: Cross-sectoral Planning and Management Approaches

The principle of integration of the Integrated Coastal Zone Management (ICZM) was developed in the context of the Agenda 21, a product of the first Rio Summit in 1992, to achieve sustainable development in coastal areas, in addition to a well-codified institutional process that needs to be driven by science-based information at each step of the process. ICZM has been widely acknowledged as a way of managing the sustainable development and use of coastal and marine areas and, by extending this approach in national exclusive economic zones (EEZs), applying marine spatial planning as a tool to support the planning and regulation of human activities within the marine environment. Adaptation roadmaps for the coastal areas have often been developed by applying a climate lens to the ICZM policy cycle used by coastal practitioners. The contemporary ICZM plans (e.g. Coastal Zone

Management Act in Belize) serve to enhance climate adaptation by considering the long-term horizon and providing a risk-informed decision-making, as well as costs and benefits of adaptation measures for adaptive planning and management. As such, adaptation actions/implementation are embedded in legal/institutional and participatory frameworks for integrated decision-making to allow cross-sectoral sustainable and adaptive management of the coastal and marine areas.

Marine Spatial Planning (MSP) has also been recognized as a veritable framework to bring together the different users of the ocean to make coordinated decisions that allow for a more sustainable use of marine resources, including for coastal area protections contributing to climate adaptation efforts as well as protection of marine fisheries that will help communities adapt to climate change. MSP processes globally have matured over the last decade from being a process/tactical (conceptual) approach to an operational approach for attaining sustainable development of national waters. At present, about 75 countries have some form of spatial ocean management initiatives underway, and marine spatial plans now cover almost 15% of the world's EEZs, as over 20 countries have already implemented their marine spatial plans, and at least a third of the surface area of the world's EEZs is projected to have government-approved marine spatial plans by 2030 as promoted by IOC-UNESCO and the European Commission in the context of the Joint Roadmap to accelerate Marine Spatial Planning worldwide³².

ICZM plans for resilience-building: Coastal Zone Management Act in Belize

The Coastal Zone Management Act (1998), Chapter 329, Laws of Belize, is an example of legislation that establishes the legal framework for coastal zone management for cross-sectoral integration and coordination of resilience-building management interventions. The plan applies both Ecosystem Services Valuation and Marine Spatial Planning approaches to map, zone and allocate permissible human uses that promote a balanced mix of conservation and utilization. It examines the tradeoffs of three future management scenarios: Conservation, Development and Informed Management, and the consequent impacts to key habitats and the delivery of ecosystem benefits. The net result is that the Informed Management strategy for Belize's coastal zone can support and bolster economic development but allows for the long-term viability of ecosystem function and the delivery of ecosystem services. The implementation of the Plan has been in effect since 2016. The example of Belize has also been identified by the Central African Countries (Cameroun, Gabon, Congo, D.R. of Congo, Equatorial Guinea, Sao Tome and Principe and Angola) to understand the linkages on how an effective ICZM policy can address coastal vulnerability issues.

Climate adaptation considerations integrated into MPAs plans and Ecosystem-based adaptation

Climate adaptation considerations are starting to become more integrated into MPA management plans, for example for the Portland Bight Protected Area in Jamaica. Systems-level trans-boundary approaches need to be considered to build resilience, for example the Organisation of Eastern Caribbean States (OECS) is currently implementing the Caribbean Regional Oceanscape Project (CROP) focusing on multiple-use ocean planning and integrated management techniques for better decision-making across transboundary marine systems to achieve regional blue economy aspirations. There are several initiatives that promote ecosystem-based adaptation in the Pacific. At the regional level, the PEBACC or the Pacific Ecosystems-based Adaptation to Climate Change Project is a five-year project that explores and promotes Ecosystem-based Adaptation (EbA) options for adapting to climate

³² http://www.mspglobal2030.org/wp-content/uploads/2019/04/Joint_Roadmap_MSP.pdf

change. The Project is implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) in partnership with the Governments of Fiji, Solomon Islands and Vanuatu. The overall intended outcome of the project is: EbA is integrated into development, climate change adaptation and natural resource management policy and planning processes in three Pacific island countries providing replicable models for other countries in the region. Marine Spatial Planning has also been implemented in the Pacific at the EEZ level implemented through SPREP, GIZ & IUCN and covered Fiji, Kiribati, Vanuatu, Solomon Island, Tonga and Samoa.

Adaptation measures and solutions

Climate adaptation for coastal and marine ecosystems has evolved from a more traditional infrastructure/engineered approach for coastal protection to the Nature-based Solutions (NBS) approach that aims at prevention and resilience building in the coastal and marine areas. The technologies that aim at building resilience of the natural system and coastal communities include the traditional engineered solutions, NBS, hybrid technologies and non structural solutions (e.g. legal and regulatory), which can be in synergy with the above cross-sectoral planning and management approaches for integrated coastal and marine adaptation. The most effective combination of above technologies can be considered in each adaptation and there is a growing demand for solutions which exhibit synergy between the above technologies.

Nature-based Solutions (NBS) for climate change adaptation

Nature-based Solutions (NBS) for climate change adaptation refers to the conservation, sustainable management and restoration of natural or modified ecosystems to help societies adapt to climate change (for example restoring mangrove forests or conserving coastal wetlands). NBS offer cost-effective solutions for adaptation that build resilience to a range of climate change impacts and provide significant co-benefits for people and biodiversity, and are increasingly prominent across international frameworks to address societal challenges particularly in developing nations. Coastal ecosystems, such as seagrass beds or salt-marshes, reduce the risk to people, infrastructure, and economic activities from flooding, erosion, storm surges, tsunamis, and sea level rise for example by attenuating wave energy. As part of an integrated planning approach for coastal zones, utilizing the ecosystem services that healthy coastal ecosystems can provide, can improve livelihoods, help to mitigate the humanitarian impacts of disasters, and enhance climate resilience.

Nature-based Solutions (NBS) for coastal and marine ecosystems are often implemented in a holistic, landscape-scale approach that recognizes benefits of the interventions to local communities as well as conservation benefits. As a recent report from the Global Commission on Adaptation states, *“Nature-based solutions often work well at a broad scale, such as in whole watershed restorations or along coastlines. They can be more cost-effective than engineered approaches, like seawalls, and can also work well in tandem with those engineering approaches to control floods, protect coasts, and reduce urban heat.”*³³ Given the high mitigation value and existing IPCC GHG methodological guidance of some coastal wetlands such as mangrove forests, salt marshes, and seagrass meadows, NBS approaches for adaptation may also want to consider how to best start accounting for the mitigation

³³ Adapt Now: A Global Call for Leadership on Climate Resilience. Global Commission on Adaptation. Page 31
https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf

co-benefits of the coastal ecosystems within a national adaptation plan or NDC.

Stronger emphasis is now paid to the role of NBS for adaptation and the potential for NBS to be hybrid solutions, which are landscape approaches that combine conservation, restoration and sustainable management with traditional or engineered approaches. Hybrid NBS solutions challenge siloed, sector-specific approaches and encourage stronger integration by bringing together multi-sectoral actors in biodiversity, engineering, landscape planning, communities and governmental agencies.

A global standard for nature-based solutions

All these financed/co-financed practices through international collaborations and projects have been continuously building knowledge in adaptation and actionable efforts worldwide, while advancing technological support to strengthen adaptation. This knowledge, via public consultation with the adaptation community, is directly feeding into the development of the IUCN Global Standard for Nature-based Solutions (NBS)³⁴. This standard itself emphasizes how NBS themselves are designed to be climate resilient and take uncertainties in climate predictions into account. The IUCN Global Standard for NBS has a criterion that addresses how NBS are designed at a sea/landscape scale, which means in this case investigating and considering synergies with other types of solutions. For example, to protect a community from storm surges it may be most effective to restore the coastal ecosystems and build a grey wall. Or to build resilience in a coastal community it might require technology innovation as well as ecological actions.

Community-based approaches

Community-based approaches are important in coastal areas worldwide, and are being implemented in conjunction with ecosystem-based approaches. Participatory tools have been developed to facilitate ecological and social vulnerability risk assessments and local adaptation planning and action. In the Caribbean for example, community-based approaches led by civil society and resource users (e.g. fisher folk and community micro-enterprises) are building resilience in coastal ecosystems and community livelihoods.

Building vibrant, empowered and resilient communities

The Locally-Managed Marine Area Network (LMMA)³⁵ is a group of practitioners involved in various community-based marine conservation projects around the globe, primarily in the Indo-Pacific, who have joined together to learn how to improve the management efforts. In using an LMMA approach, some coastal communities are reviving methods that have been used traditionally as part of their culture for many generations, sometimes blending them with modern techniques for optimal results. Different countries have different traditions for such marine protection. By addressing stressors to local coastal areas, these communities are able to improve the resilience of their coastal areas to the growing effects of climate change.

Blue economy

Sustainable blue economy is based in the maritime economy that provides social and economic

³⁴ <https://www.iucn.org/theme/ecosystem-management/about/our-work/a-global-standard-nature-based-solutions>

³⁵ <http://lmmanetwork.org>

benefits for current and future generations by contributing to food security, poverty eradication, livelihoods income, health, safety, equity and political stability. The definition also considers the protection and maintenance of the diversity, productivity, resilience amongst other core functions that are intrinsic to the marine ecosystems and the natural capital upon which its prosperity depends. The concept of blue economy is increasingly being used, including in Pacific and Caribbean SIDS to explore the potential for enhancing economic development in these “large ocean states” based on the sustainable use of marine and coastal resources. Recent dialogues at the Caribbean Blue Economy Conference hosted by the Caribbean Development Bank also emphasise the need for inclusive blue economy approaches that provide equitable economic benefits to poor and vulnerable coastal communities, and recognised that economic development must also enhance resilience to climate change and natural hazards.

Blue economy proclaimed as the ‘New frontier of an African renaissance’

Commitment to transformative actions for sustainable blue economy is gaining traction across Regional, Sub-regional and national levels in Africa. The African Union Commission has proclaimed blue economy as the ‘New Frontier of an African Renaissance’ and in 2014 adopted the 2050 African Integrated Maritime Strategy (AIMS) which identified the development of blue economy as the engine of growth, capable of driving industrialization, alleviating poverty, increasing food security and creating job opportunities in the continent. In line with the AIMS 2050, several African countries are already formulating strategies to mainstream blue economy in their national development plans. Countries like South Africa, Mauritius, Seychelles, Mauritania or Cape Verde are already taking giant strides, developing and implementing national blue economy strategies, achieving early success and generating several good practices. In the Pacific, the Pacific Islands’ Parliaments group recently met in Papeete on the topic of sustainable Blue Pacific. In the Taraho’I declaration, they recognized that the sustainable blue economy integrates the three dimensions of sustainable development (economic, social, and environmental), and that it requires measured, equitable and responsible management and utilisation of resources and ecosystems by all stakeholders. This declaration demonstrates the Pacific’s vision that sustainable development cannot be separated from ocean or climate issues as they are interlinked.

Building resilience of the fisheries sector

Work is also being done to build resilience of the fisheries sector to address food security concerns. FAO is implementing the GEF-funded Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (CC4Fish) project to address vulnerability of the small-scale fisheries sector. Belize is strengthening its capacity to quantify, monitor and interpret the impacts of climate change and human activities on key commercial fisheries and reef ecosystems. CANARI has developed a methodology to help micro and small community “local blue enterprises” (e.g. in community ecotourism, small-scale fisheries, agro-processing) to assess vulnerabilities along their value chains and to implement adaptation measures. The restoration, conservation and sustainable use/management of coastal ecosystems can provide benefits to fisheries as many coastal ecosystems act as nurseries for key fishing stocks.

Initiatives in the Pacific region

The Commonwealth Marine Economies Program has a component in the Pacific, which produced the first Pacific Marine Climate Change Report card in 2018. The report summarises key climate change

impacts on marine coasts and seas in the Pacific and outline how Pacific Islands can respond. This work, funded by the UK Government involved UK based scientific agencies as well as regional organisations. In the Pacific, work has also been undertaken in assessing the vulnerability of Pacific Islands tropical fisheries and aquaculture to climate change. The comprehensive study for all Pacific Island Countries and Territories was concluded in 2011. Recent consortium study among regional and international agencies looked at the implications of climate change on the tuna resource and revenue – given the highly tuna dependent Pacific Island region.

4.3 Adaptation actions and projects in force

Sea level rise and the outer limits of maritime zones and boundaries

Scientific assessments have confirmed that sea levels are rising, and likely to top median levels of one meter, by the year 2100. Other scientists have posited that the 1 meter prediction is heavily conservative, and that taking into account all of the variables, sea levels could, in effect, rise to 2 meters by the 2100.³⁶ For the peoples of the Pacific, these assessments should be cause for alarm, noting the multi-dimensional vulnerabilities of Pacific communities.

The effects of the sea level rise on the baselines and – through the baselines – on the outer limits of maritime zones is being considered by the International Law Commission, which has included “Sea-level rise in relation to international law” in its programme of work and has established an open-ended Study Group on the topic.³⁷

Practice to declare baselines as permanent and not subject to the future impact of sea level rise

In the Pacific, climate change impacts and ocean is an important priority. A key concern, amongst others, is the impact of the total or partial loss of land territory which might result from sea level rise and the resulting implications, including in relation to maritime zones and boundaries. As a result, Pacific SIDS have actively engaged in delineating the outer limits of their maritime zones pursuant to the United Nations Convention on the Law of the Sea (UNCLOS) and delimiting maritime boundaries with neighbouring countries where overlapping claims exist. To this end, a number of Pacific States have made deposits with the Secretary-General of the United Nations, in accordance with UNCLOS, relating to baselines (i.e. the starting point from which the breadth of maritime zones is measured), outer limits of maritime zones and maritime boundaries. A regional practice is also emerging amongst Pacific SIDS to declare their baselines as permanent and not subject to the future impact of sea level rise, as agreed to under the Pacific Oceanscape Framework endorsed in 2010 by the Pacific Island Leaders. In this connection, it should be noted that the receipt of a deposit by the Secretary-General does not imply the expression of any opinion on his part concerning the deposited lines.

Areas action in countries

SIDS face disproportionate challenges in adaptation and are particularly vulnerable to sea level rise and storm surge. The least developed SIDS are even more vulnerable to climate change because of rapid population growth and infrastructure concentrated in coastal areas, weak or non-existent regulation and governance systems – including land tenure, unsustainable land use practices and

³⁶Bamber, Oppenheimer, Kopp, Aspinall, and Cooke; (2019) ‘Ice sheet contributions to future sea-level rise from structured expert judgment’. Available at <https://doi.org/10.1073/pnas.1817205116>; (Accessed May 17, 2019).

³⁷ See seventy-first session of the International Law Commission, Sea-level rise in relation to international law,” Summaries of the Work of the International Law Commission in 2019 available at: http://legal.un.org/ilc/summaries/8_9.shtml.

planning, degraded natural resource base and capital, human and technological resource constraints. SIDS in particular require innovative methodologies for a quantitative assessment of multiple natural hazards in coastal areas, driven by different hydro-meteorological events and including the effects of climate change, with consideration of options to assess and compare the effectiveness of possible disaster risk reduction measures. Studies and assessments are ongoing around the world, e.g. in the Republic of the Marshall Islands.

Small Island Developing States (SIDS)

Climate resilience has become central to Caribbean SIDS' national development agendas in response to the devastating impacts of storms and hurricanes, which are recognised to be increasing in severity due to climate change. Dominica's Prime Minister declared interest in Dominica becoming the first "Climate Resilient Island" and the President of the Republic of Seychelles created the international Sea Level Rise Foundation, which is an example of the high-level awareness and commitment to preparing adaptive strategies in light of global climate change. Global Island Partnership³⁸, led by the Presidents of Palau, Seychelles and the Republic of the Marshall Islands, the Prime Minister of Grenada and the Premier of the British Virgin Islands, promotes action to build resilient and sustainable island communities by inspiring leadership, catalyzing commitments and facilitating collaboration for all islands. The political commitment and the centrality of climate as a development issue is clear.

For highly populated mega-deltas, which are particularly vulnerable to pressures from climate change, adaptive planning approaches with a long-term horizon are being developed.

Densely populated mega-deltas

The Netherlands, located in a dynamic and densely populated delta, developed an adaptive delta management approach under the Delta Programme with adaptation strategy policies looking a hundred years into the future to protect against flooding and to secure a supply of fresh water. Given its vulnerable position in a low-lying delta and with national safety in mind, the Netherlands invests in adaptation works and developing adaptation knowledge. This valuable experience with application of infrastructure, engineering and nature-based solutions for effective responses and adaptation, is shared through international networks, e.g. in the Delta Alliance³⁹ organization, which is an international knowledge-driven network to improve the resilience of the world's deltas. Vietnam (Mekong Delta Plan), Bangladesh (Bangladesh Delta Plan), and Benin are among the countries that have been successfully developing adaptive delta plans with a long-term vision through such international collaborations.

Coastal cities and delta cities with high concentrations of population and economic capital are on the frontlines when it comes to climate change impacts and severe marine-weather.

Coastal and delta cities

Climate challenges are being addressed by megacities through various international platforms, such as the Rockefeller Foundation 100 Resilient Cities, the C40 Connecting Delta Cities Network, to collaborate effectively, share knowledge and drive sustainable actions on climate change. Many

³⁸ <http://www.glispa.org>

³⁹ <http://www.delta-alliance.org/about-delta-alliance/organisation>

coastal cities have developed urban climate adaptation strategies, which serve as frameworks for governments, allow for information sharing between stakeholders, and facilitate applications for financial support. These urban climate adaptation strategies generally consist of the same ingredients, which provide a source of information for applications and for coastal adaptation.

Climate and non-climate stressors impact coastal and marine ecosystems, which intensify the stress on these vulnerable ecosystems. Non-climate stressors impair the resilience of coastal and marine ecosystems and make them particularly vulnerable to climate change.

Critical coastal and marine ecosystems

Productive and critical marine and coastal ecosystems such as mangroves, coral reefs, seagrass meadows, open ocean and deep seas are being significantly impacted and lost, as a result of anthropogenic activities like resources over-exploitation and extractive industries. The first World Ocean Assessment⁴⁰ identifies a decline in ocean health with significant changes and losses in the structure, function and benefits obtained from marine ecosystems. Many initiatives are underway, from local-level coral reef and mangrove restoration (e.g. mangrove reforestation in Can Gio, Southern Vietnam, and mangrove planting projects in Northern Vietnam; coral reef restoration in Grenada), to ambitious global initiatives such as the Resilient Reefs Initiative whose overarching objective is to develop and pilot an innovative model for resilience-based reef management in five marine World Heritage Sites, including the Belize Barrier Reef Reserve System.

⁴⁰ The first global integrated marine assessment was adopted by the United Nations General Assembly resolution 70/235 on “Oceans and the law of the sea” (2015)





5. Knowledge: Good Practices, Gaps and Needs

Adaptation knowledge has been increasing in the last several years. The findings of the IPCC have been considered by many regions in the world and in particular by countries located in low-lying mega-deltas or islands, where socio-economic development is mostly threatened by climate change. Many projects have been funded in a range of topics from developing adaptation knowledge (research and innovation), working with nature for adaptation outcomes, to building resilience capacity with a long-term horizon, supporting local authorities in enabling adaptation actions, and developing actionable adaptation strategies and plans.

There are many existing examples of good practices on adaptation efforts at a regional, national and stakeholder engagement level, that continue to address new and emerging research and scientific gaps. Regional variation in the capacity to implement adaptation practices exists, with adaptation and resilience responses varying by region. This regional variation may be due to limited resources (funds and staff), access to information, knowledge and technologies, collaboration and partnership, enabling environment, among others.

Scoping and engaging with the expert group to identify good practices, knowledge gaps and needs

The main focus of this scoping paper is to identify adaptation good practices, knowledge gaps and needs to map knowledge gaps yet to be filled. Mapping of good practices and knowledge gaps has been a joint effort of the NWP Expert Group on the ocean, and it is the first attempt, which will be continued during the 13th Focal Point Forum and beyond in the context of the NWP.

Knowledge gaps involve a number of topics that range from bio-physical, socio-economic to governance aspects, thus for the purpose of forum discussion, we grouped them in the following areas based on a strong and joint advocacy and promotion from all experts and NWP partners:

- **Governance & Participation** that considers mainstreaming adaptation at all governance levels, development of strategies and legal frameworks, institutional strengthening, cross-

sectoral institutional coordination mechanisms, global-regional-sub-regional-national-local institutional linkages for coordination and information flows, participation mechanisms;

- **Data & Methods** that considers data/information/methods/services/products for assessments, implementation and monitoring; ecosystem-based methods for adaptation planning and implementation;
- **Technology & Innovation** that considers technologies and innovation for preventing risks, sustainable planning and infrastructure;
- **Restoration & Protection** that considers coastal and marine ecosystem restoration, coral restoration, mudflats, tidal marshes, natural regeneration; protection of healthy ecosystems and/or ensuring their appropriate sustainable management;
- **Capacity-building & Education** that considers capacity-building, ocean/climate literacy, environmental education, local level adaptation, community-based participatory research, broad stakeholder engagement, and gender-responsive and socially inclusive approaches;
- **Finance & Funding** that considers various funding and financing, public and types, including blended financing, private investments, bankable projects.

These areas are presented briefly on the next pages, including examples of gaps and needs, and examples of good practices⁴¹.

⁴¹ There are only a few examples of adaptation gaps, needs and practices illustrated in the Scoping Paper. The longer list is available in the *Additional Information* annex.



GOVERNANCE & PARTICIPATION

This area considers: mainstreaming adaptation at all governance levels in policy development, development of strategies and legal frameworks, interactive governance, institutional strengthening, strengthening/ establishment of cross-sectoral institutional coordination mechanisms, knowledge-based decision-making, linking global-regional-national-sectoral-local efforts including institutional linkages for coordination and information flows.

EXAMPLES OF GAPS AND NEEDS:

- The need to build a global coordinating mechanism, which interlinks with other levels;
- Interactive governance mechanisms and building public-private-civil society partnerships to address climate adaptation across sectors and at multiple levels;
- Institutional strengthening and capacity development, including in support of cross-sectoral, integrated governance mechanisms (including gender-responsive governance);
- Collaboration to address trans-boundary resources and issues, including coordination within SIDS regions;
- Mainstreaming climate adaptation into coastal communities, supporting engagement and adaptation action by local communities and resource users, including women and men;
- Engagement of Indigenous and traditional Knowledge in decision making processes - including indigenous/traditional/local women and men as active partners and knowledge producers;
- Understanding Country/Sub-region/Region-Specific Knowledge (cultural, political, ecological dimensions and beyond);
- Mainstreaming scientific information and knowledge to the decision-makers for risk-informed decisions;
- Using state and non-state leaders, champions, innovators, entrepreneurs etc. as change agents;

Recent papers⁴² and the first Marine Regions Forum Meeting (2019) under the Partnership for Regional Ocean Governance indicate that the global-regional-national institutional setup as a whole is needed, rather than a piecemeal approach. The need to build a global coordinating mechanism, which interlinks with other levels, should be highlighted here. Current arrangements are inadequate and a key area to highlight is what knowledge is needed to inform the institutional reforms needed, including what can we learn from existing initiatives.

The complex nature of climate change poses unique challenges for institutions charged with mitigating, and/or adapting to, its impacts. This is particularly true for institutions at the local level in developing countries. Effective local adaptation requires responsive local governance from local institutions that are often constrained by weak technical and managerial capacity, poor linkages with other institutions at different levels (national, regional, global), weak systems for gathering and disseminating information, and unclear mandates and conflicting priorities between levels and agencies of government.⁴³ The urgent needs caused by climate change have led to ad-hoc projects which may have limited impact and low long-term sustainability.⁴⁴ The Paris Agreement recognizes

⁴² Mahon, R and L. Fanning. 2019. Regional ocean governance: Polycentric arrangements and their role in global ocean governance. *Marine Policy* 107. <https://doi.org/10.1016/j.marpol.2019.103590>

Mahon, R and L. Fanning. 2019. Regional ocean governance: Integrating and coordinating mechanisms for polycentric systems. *Marine Policy* 107. <https://doi.org/10.1016/j.marpol.2019.103589>

⁴³ Arun Agrawal, Minna Kononen and Nicolas Perrin. The Role of Local Institutions in Adaptation to Climate Change, *SOCIAL DEVELOPMENT WORKING PAPERS*, Paper No. 118/June 2009.

⁴⁴ Clare Shakya, Katherine Cooke, Naman Gupta, Zac Bull and Sam Greene, 2018; *Building institutional capacity for enhancing resilience to climate change: An operational framework and insights from practice*; Action on Climate Today, Oxford Policy Management: <http://www.acclimatise.uk.com/wp-content/uploads/2018/02/GIP01916-OPM-Strengthening-institutions-Proof4-web.pdf>

that a different approach is needed for long-term impact, and calls for capacity building that is, "country-driven, based on and responsive to national needs, and foster country ownership", as well as being "an effective, iterative process that is participatory, cross-cutting and gender-responsive."⁴⁵ Such capacity building can lead to long-term strengthening of national and subnational institutional arrangements, informed by regional and global developments, and the building of institutional capacities at the local level to deal with the unique challenges of climate change. Local institutions are crucial for the effectiveness of local adaptation projects, in particular by mediating resources from extra-local institutions whose accountability and legitimacy cannot be deduced by the local community in question.⁴⁶

Interactive governance that facilitates collaboration among public, private and civil society actors across sectors is a critical need to address the multi-dimensional impacts of climate and responses needed. In addition, in many regions a lack of coherence and coordinated cooperation is recognized between science and policy makers in planning activities with scientific projects and outcomes often disconnected from planning activities by the authorities.

Mechanisms for multi-stakeholder engagement in regional, national and sub-national ocean-climate governance

At the regional level, the Caribbean Community (CARICOM) Regional Framework for Achieving Development Resilient Climate Change (2009-2015) and the CARICOM Regional Comprehensive Disaster Management Strategy (2014-2024) provide frameworks for collaborative action. Addressing trans-boundary issues is the focus of the politically-endorsed Strategic Action Programme for the Sustainable Management of the Shared Living Marine Resources of the Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME+ SAP). To advocate for their role in its implementation, civil society developed its own CLME+ Civil Society Action Programme to facilitate and promote the role of civil society, local communities and resource users like small scale fisherfolk and community entrepreneurs as partners in interactive governance.

Mechanisms for coordinated governance have also been developed at the national level. Various countries have been developing their national plans for adaptation and/or resilience building, e.g. Vietnam (Mekong Delta Plan), Egypt Delta and Coastal Adaptation Plan, Belize Integrated Coastal Zone Management (ICZM) Plan (2016), Seychelles Coastal Management Plan 2019–2024. An example of a Marine Spatial Planning process is in the Seychelles with established coordination mechanisms across relevant national Ministries, Agencies and Departments, including participation of key sub-national representations to promote vertical as well as horizontal coordination and cooperation, elevates the importance of the ocean and coastal adaptation.

Engagement of civil society is needed at the national and sub-national levels, and an example of how this is being addressed is the development of Civil Society Agendas in support of national policies to address climate change by civil society in Saint Lucia and Tobago.

⁴⁵ Paris Agreement, Article 11(2): https://unfccc.int/sites/default/files/english_paris_agreement.pdf

⁴⁶ Yomo, Mawulolo and Villamor, Grace B. and Aziadekey, Mawuli and Olorunfemi, Felix, *Local Institutions' Role in Enhancing Climate Change Adaptation of Rural Farmers in Semi-Arid Ecosystems in Northern Ghana Using Social Network Analysis* (July 10, 2018). PAUWES Research-2-Practice Forum 2018. Available at SSRN: <https://ssrn.com/abstract=3211273> or <http://dx.doi.org/10.2139/ssrn.3211273>.



DATA & METHODS

This area considers: data/information/methods/services/products for assessments, implementation and monitoring, as well as methods (e.g. ecosystem-based) for adaptation planning and implementation.

EXAMPLES OF GAPS AND NEEDS:

- Data and information for reliable forecasts and assessments; coupling ocean-climate; for preparing adaptation plans;
- Responding to the combined effect of climate change sea level rise and large tsunami inundation events;
- Ocean data and information gaps exist in coastal areas, in particular related to marine-ecosystem health within countries EEZ in support for climate change adaptation;
- Tremendous data gaps concern the deep ocean, beyond EEZ and coastal zones, and that lack of basic knowledge has implications for not only climate change research, but also for managing coastal zones in many parts of the world (e.g. recurring problems of sargassum);
- Improved knowledge and understanding of how Harmful Algae Blooms (HABs) and climate change stressors interact to affect aquatic life in marine and freshwater ecosystems is needed to formulate management and adaption plans;
- Attributing and differentiating loss and damage from climate change and other natural causes, understanding long-term impacts on livelihood, food security, businesses and well-being;
- Uniform policy outlining climate change related data sharing and utilization guidelines;
- Participatory methods for vulnerability risk assessments, adaptation planning and monitoring effectiveness;
- Integration of Indigenous and local knowledge alongside scientific knowledge;
- Knowledge about the adaptive capacity of society;

Knowledge gaps and needs in this area can be vast from availability and access to data and information, availability of tools and methods for forecasting of marine-weather/climate extremes and resulting hydrological risks and storm surge prediction, to knowledge about the adaptive capacity of ecosystems (e.g. mangroves, corals) and society. Availability of data and information is a global gap. The two main problems are that 1) we collectively lack data on many ocean variables today (relative poor scope and geographical coverage, few/limited time series for many variables), in particularly with the granulariry needed to make predictive models work well for many regions of the world; 2) there is a strong dissymetry between the relatively limited number of stakeholders that have the means and resources to collect and manage data and the rest of the international community. Knowledge gaps can significantly hinder our forecasting ability leading to uncertainties of predictions that have an impact on adaptation plans in the marine and coastal areas.

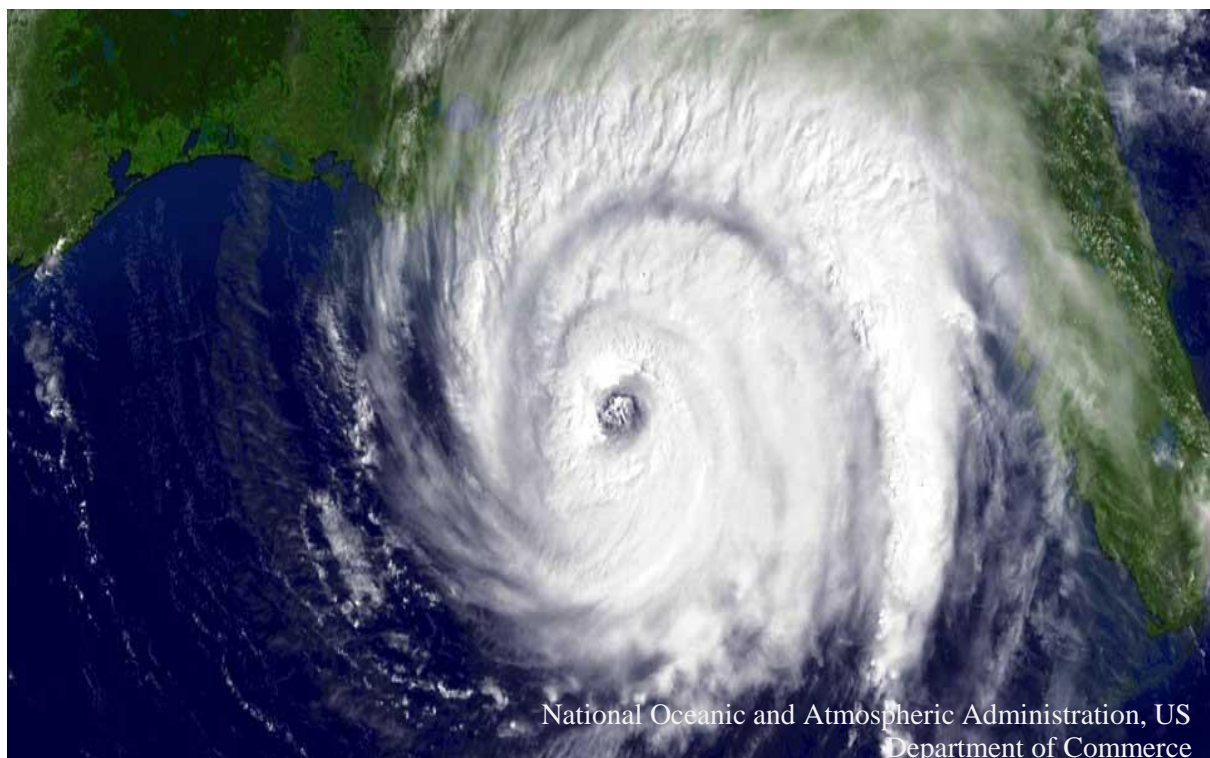
New partnerships, integrated ocean observation, participatory tools and methods

New partnerships are envisaged under the new GOOS (Global Ocean Observing System) 2030 Strategy to provide one integrated system that can deliver data and information that support climate change adaptation and resilience building. An integrated sea level monitoring system like SONEL⁴⁷ provide an integrated sea level monitoring system (different types of data, sources, time and space scales), with a sea level information system handling the data by different observation networks. It is important to

⁴⁷ <https://www.sonel.org>

foster and coordinate ambitious international ocean science data programmes (e.g. through the UN Decade of Ocean Science for Sustainable Development) and promote concrete cooperation schemes with the “haves” and “haves-not”.

Innovations and best practices exist in the development and application of participatory tools and methods to document local and traditional knowledge of coastal communities (e.g. to develop community adaptation plans, build resilience in small-scale fisheries and “local blue enterprises”). The use of Participatory 3D Modelling (for example in Tobago, Dominica and Grenada) is a good example of how this can be done. However, more needs to be done to integrate this knowledge into scientific systems and decision-making. Additionally, standardise and robust baseline ecosystem risk assessments are critical to analyse and compare the status of conservation of marine and coastal ecosystems accross regions as well as to identify major environemnetal and human-driven threats (e.g. the IUCN Red List of Ecosystems).





TECHNOLOGY & INNOVATION

This area considers: technologies and innovation for preventing risks, sustainable planning and infrastructure, technologies and innovations for supporting improved ocean governance and adaptation;

EXAMPLES OF GAPS AND NEEDS:

- Access to technology for forecasting of marine-weather/climate extremes and resulting hydrological risks and storm surge/tsunami prediction/forecasting, for modelling integrated/combined coastal vulnerability and impacts;
- Many countries lack national operational ocean forecasting systems and/or access to such services/products for forecasting marine weather extremes to support maritime operational services, blue economy growth adaptation and resilience building;
- Access to ocean-related innovations to foster sustainable economic development;
- International cooperation in marine technology to stimulate sustainable ocean innovation;
- Systematic consideration of the marine technological interests of underserved regions throughout the ocean innovation process;
- Potential impacts of technologies on ocean and coastal ecosystems;
- Channels for regularized technological learning/exchanges across domains of marine and coastal practice;
- Risks and uncertainties of technological developments, including risks to local livelihoods;
- Enhancing marine scientific research, upgrading marine technological capabilities and expanding international cooperation;
- Refinement and reduction of carbon footprints of new ocean/marine technologies (even as most of the often more costly than existing fossil fuel-based options);
- Make technologies necessary for coastal, marine and climate change research more inclusive;
- Full implication of technology and innovation systems toward sustainable ocean development and ensuring that all innovation stages and scales are considered at the outset;
- Supporting local innovation and use of technologies by communities and micro-enterprises, including for both women and men;

Technology together with innovation goes beyond preventing risks, it can support improved ocean governance and adaptation. Getting access to new monitoring technologies and information systems is completely changing the management of ports, MPAs, etc in many parts of the world contributing to adaptation. It also improves vastly the fight against illegal fishing, as long as enforcement systems are designed alongside. Local communities and micro-enterprises need access to appropriate technologies (e.g. small-scale solar technology is being used by communities in Trinidad and Tobago) and they also need support to innovate. Furthermore, women and men engaged with micro-enterprises need appropriate knowledge on business management, maintenance and bookkeeping to ensure innovation is long-term and accessible to all members of the community. Mariculture innovation by a community enterprise in Mayreau in the Grenadines is enhancing resilience of edible algae they are farming to increased wave action by stronger storms and support is needed to scale this out across the Caribbean.

Recent innovative solutions consider more often sustainable use of ocean resources and application of sustainable management plans for the coastal areas. There is a high interest in application of a range of technologies for commercial purposes and for gaining a better understanding of marine ecosystems and the requirements for their better management⁴⁸.

⁴⁸ OECD 2019. Rethinking Innovation for a Sustainable Ocean Economy. <http://www.oecd.org/publications/rethinking-innovation-for-a-sustainable-ocean-economy-9789264311053-en.htm>



RESTORATION & PROTECTION

This area considers: coastal ecosystems, mega-deltas, SIDS, vulnerable ecosystems – mangoves, seagrass meadows, coral reefs, coastal ecosystem restoration and protection, coral restoration

and protection, mudflats, tidal marshes, natural regeneration.

EXAMPLES OF GAPS AND NEEDS:

- Accurate and detailed maps of extend and use of all types of coastal ecosystems (e.g. seagrasses);
- Knowledge about the current capacity of coastal and marine ecosystems to adapt and cope with climate and non-climate impacts;
- Continuing research on how NBS actions can help reduce storm surges;
- Offsetting the impact of ocean acidification and the role of mangroves and seagrass which take up carbon dioxide;
- Increasing actions to reduce the rate of mangrove degradation and halt historic habitat loss;
- Implementing and developing measures for assessing the effectiveness of ecosystem-based adaptation (EbA) actions in the marine and coastal ecosystems;
- Strengthening institutional arrangements and policies for restoration;
- Information and capacity to assess mitigation co-benefits of coastal ecosystems (blue carbon ecosystems: seagrass, salt marshes, and mangrove forests);
- A knowledge, capacity, expertise and practice deficit when it comes to the ocean;
- Involvement of Indigenous Peoples, women and local knowledge in restoration efforts and benefit distribution;
- Knowledge about the adaptive capacity of society and the environment;
- Increasing the adaptation knowledge, expertise and practice in oceans beyond the coastal zone;

Knowledge gaps around restoration include the need for both capacity building and improved technical best practices in site and species selection, integrated coastal planning, long-term monitoring and maintenance, and sound policies coupled with better protection and governance of mature mangrove forests. Mapping loss and distribution of coastal ecosystems can be a data gap, impeding effective planning, management, and restoration. Many countries have reasonable data on mangroves and certain coastal ecosystems which can be collected and assessed, but seagrasses and salt marshes are harder. Conservation and sustainable management of remaining mangrove forests in conjunction with restoration and natural regeneration will halt the loss of these ecosystems and ensure ecosystem functionality for climate adaptation and mitigation (as “blue carbon”), human livelihoods and well-being, and biodiversity conservation.

Examples of partnerships and initiatives dedicated to address some of these challenges include: The Global Mangrove Alliance⁴⁹ - a partnership of IGOs, NGOs, governments, and local communities working towards a common goal of halting mangrove degradation and expanding mangrove habitat by 20% by 2030; The Coral Triangle Initiative (Indonesia, Malaysia, Philippines, PNG, Solomon Islands, Timor-Leste): The Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF) is a multilateral partnership of six countries working together to sustain extraordinary marine and coastal resources by addressing crucial issues such as food security, climate change and marine biodiversity. International Partnership for Blue Carbon is another example of a government-led partnership that seeks to protect and conserve coastal blue carbon ecosystems for climate change mitigation and adaptation⁵⁰.

⁴⁹ <http://www.mangrovealliance.org/>

⁵⁰ <https://bluecarbonpartnership.org>



CAPACITY-BUILDING & EDUCATION

This area considers: capacity building, ocean/climate literacy, environmental education, local level adaptation, community-based participatory research, broad stakeholder engagement, and gender-responsive and socially inclusive approaches, awareness as increasing knowledge, which is captured in education and literacy, awareness as advocacy: influencing policy and practice.

EXAMPLES OF GAPS AND NEEDS:

- Technical and management capacities to understand hazards and risks associated with climate change, ocean acidification, sea-level rise and other sources (combined effects), including with respect to gender-differentiated impacts and risks;
- Community-based participatory research into local effects of climate change and adaptation challenges, including on displacement of women and men and impact on their livelihoods;
- Coordination within and between SIDS regions for effective knowledge management;
- Organizational strengthening/capacities to scale up and replicate identified solutions;
- Strengthening indigenous expertise in SIDS;
- Construction of and participation in knowledge networks that can connect technical expertise to local challenges (such as women's groups and organisations);
- Best practices for substantive, not merely formal, involvement of women, men, youth and Indigenous Peoples to actively participate in adaptation actions and strategies;
- Sound educational strategies for climate change education, especially in the least developed countries, SIDS, and African countries;
- Promotion of social learning approach that encourages dialogue and fosters collaboration;

The Paris Agreement recognizes that a different approach is needed for long-term impact, and calls for capacity building that is, "country-driven, based on and responsive to national needs, and foster country ownership", as well as being "an effective, iterative process that is participatory, cross-cutting and gender-responsive."⁵¹ International, national, and local communities need to focus on climate education and participation, and to do so will require much experimentation with educational and community participatory approaches. Full participation will only be possible when communities are well-acquainted with the dangers they face, can effectively share how this is impacting on their lives and livelihoods, and are given a full voice in the planning process and creation of their own solutions appropriate to their local context and needs. The greatest knowledge gaps in this domain involve how to translate the knowledge of the scientific and planning communities into the local context, translating local and traditional knowledge for use by policy makers, creating opportunities for genuine dialogue of all involved. Effective communication of knowledge to influence policy and practice is also critical, and needs to target all levels and sectors, from global negotiators and multinational companies, to key sectors impacted by climate change, to community resource users like fisherfolk whose livelihoods are most vulnerable.

It is important to note that adaption knowledge gaps also exist due to lack of human and technical capacity in many regions, in particular in the Southern Hemisphere, SIDS, and LDCs. For example, many regions will require the formulation and implementation of integrated, cross-sectoral and coordinated approaches to the management of marine and coastal areas. Such plans will need to focus on

⁵¹ Paris Agreement, Article 11(2): https://unfccc.int/sites/default/files/english_paris_agreement.pdf

adaptation priorities, fully support the science-policy interface, and integrate the implementation of relevant SDG 14 and SDG 13 targets. For this reason, capacity building needs to expand beyond the technical, and focus on strengthening the public sector, civil society, local organizations, women's groups, and less formal networks of people.

Participation in trainings organized by IOC-UNESCO, POGO⁵², IAEA OA-ICC, GOA-ON and NGOs is high, but this represents a small number of total people reached; much training and educational efforts should focus on bringing technical capacity to the most vulnerable areas. The UN Division for Ocean Affairs and the Law of the Seas (DOALOS) also is addressing these capacity needs, but these activities could be enhanced through collaborative efforts amongst UN agencies and other stakeholders. Enhancement would address linkages between the ocean and climate adaptation frameworks, with a view to bringing together ocean and climate professionals and enable them to identify and use relevant managements tools, as well as develop and implement any necessary governance frameworks. The Galápagos Alliance, the Caribbean Natural Resources Institute (CANARI), Reef Resilience Network are examples of regional capacity-building and education organizations and networks. Capacity building via a combination of targeted methods such as training of trainers, mentoring, coaching, action learning, communities of practice and peer exchanges is effective at building knowledge and fostering change on the ground.



Artur Rydzewski, Flickr, CC BY 2.0

⁵² <http://www.ocean-partners.org/>



FINANCE & FUNDING

This area considers: considers various funding and financing, public and types, including blended financing, private investments, bankable projects.

EXAMPLES OF GAPS AND NEEDS:

- Long-term, consistent financial support is a key gap;
- Awareness of availability of financing mechanisms;
- Application of innovative financial tools for climate adaptation;
- Sustainable funding for the long-term financing of adaptation measures;
- Micro-finance to support adaptation by community “local blue enterprises”;
- Getting climate financing to local civil society and communities;
- Development and implementation of integrating EbA considerations into the insurance industry;

Some countries have gaps in national strategies for sustainable funding for the long-term financing of coastal adaptation measures. The application of innovative financial tools for adaptation is also challenging and the mobilization of national public funding to support integrated policies. An analysis of the relative importance of different types of climate finance is needed considering the focus of these on adaptation knowledge, and particularly if relevant to oceans.

National and regional funds are important channels to get funding to civil society and local communities, as well as governments (e.g. the MesoAmerican Reef Fund, the Caribbean Sea Innovation Fund, the Caribbean Biodiversity Fund⁵³ and its Ecosystem-based Adaptation Facility). For example, the Caribbean Catastrophe Risk Insurance Facility is an innovative regional fund allowing countries to purchase parametric insurance to cover extreme weather events, which are escalating due to climate change. This also includes coverage for the fisheries sector, and governments in Saint Lucia and Grenada have purchased coverage for the small-scale fisher folk. Including funding for civil society and local communities in initiatives supported by global funds (e.g. Green Climate Fund, Adaptation Fund) is also important.

Blue Bonds⁵⁴ are considered an innovative finance mechanism, and important is blended finance. Examples of national and sub-national financing: Debt restructuring in the Seychelles⁵⁵ and Mexico’s Yucatan peninsula and a coral reef insurance innovative financing scheme with the creation of the Coastal Zone Management Trust (CZMT)⁵⁶. The CZMT was established by the state government of Quintana Roo in Mexico, with participation of Mexico's National Commission of Natural Protected Areas, TNC and partners in the local science community and tourism industry.

Funding constraints are seen as one of the most pressing challenges in reaching global climate targets build on NbS. The bottleneck is not the lack of liquidity but the lack of investable resilient NbS assets. The Blue Natural Capital Financing Facility provides assistance to project developers, businesses, and financiers to advance blue endeavors with clearer NbS and climate impacts.

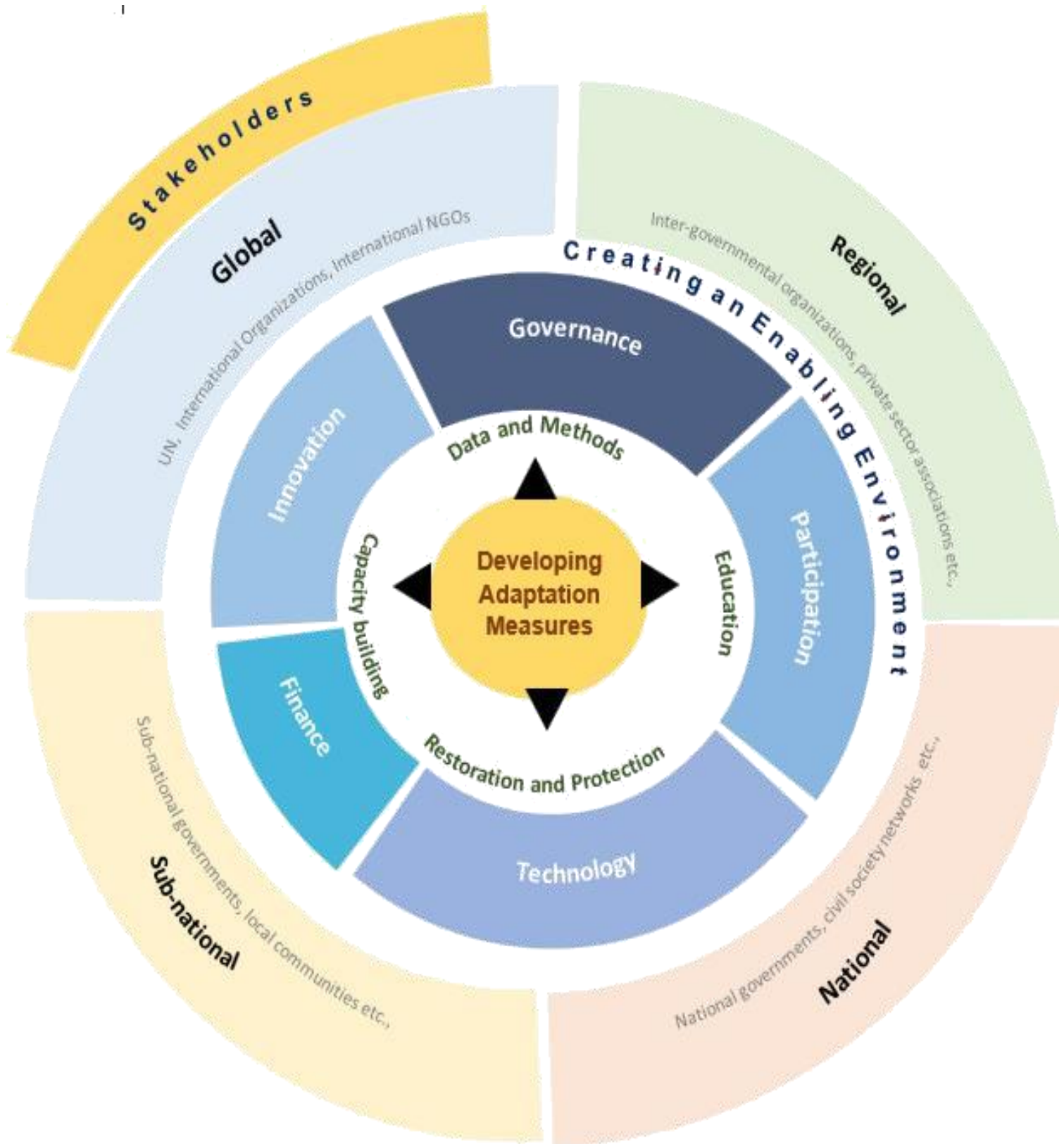
⁵³ <https://www.caribbeanbiodiversityfund.org/>;

⁵⁴ <https://www.nature.org/en-us/what-we-do/our-insights/perspectives/an-audacious-plan-to-save-the-worlds-oceans/>

⁵⁵ <https://www.nature.org/en-us/about-us/who-we-are/how-we-work/finance-investing/naturevest/ocean-protection/>

⁵⁶ <https://www.nature.org/en-us/what-we-do/our-insights/perspectives/insuring-nature-to-ensure-a-resilient-future/?src=r.v.insuringnature>

Setting up Actions for Closing Adaptation Knowledge Gaps and Needs in the World





6. Actions to Close Knowledge Gaps and Enable Adaptation Planning and Implementation

Many aspects of adaptation still present important knowledge gaps representing challenges for developing countries in particular. Knowledge gaps can hamper actionable adaptation planning and implementation at the regional, national and/or sub-national level. Credible data and information, the policy interlinkages between the ocean and climate, and sectoral and inter and intra-ministerial actions at different governance levels need to be strengthened. International organisations, regional commissions and sea conventions, governments and other stakeholders play a major role in the process of implementing transformative actions for closing adaptation knowledge gaps.

For example, at the global level incorporating key actions at the ocean/climate change nexus relevant to the global sustainable development agendas is important, likewise the biodiversity (e.g. the discussions at the 15th meeting of the Conference of the Parties (COP 15) to the Convention on Biological Diversity (CBD). The UN Ocean Conference, that will be held in June 2020, will be an opportunity to ensure climate and adaptation discussions occur in connection with the broader ocean discussions. The UN Decade of Ocean Science for Sustainable Development (2021-2030) will bolster scientific research and innovative technologies to ensure science responds to the needs of society in view of climate and ocean changes. These global actions and initiatives relevant to the global agendas need to be informed by needs at the regional, national and sub-national levels, and subsequently inform actions at these levels. Regional institutions play an important role in this two-way translation.

Various actions and steps by governments and stakeholders are needed to address the climate and ocean crises. The recently published (July 2019) *Blueprint for International Ocean-Climate Action - Goals and Steps for Governments and Stakeholders*⁵⁷ presents a set of near-term steps that governments and stakeholders could announce, as well as a set of medium-term and midcentury goals that they could adopt, to create a thriving climate and ocean.

This section presents the examples of actions required at different governance levels that are recommended to Parties, to help address adaptation-oriented knowledge gaps related to the ocean, coastal areas and ecosystems, as identified by the UNFCCC/NWP Expert Group:

⁵⁷ https://www.climateadvisers.com/wp-content/uploads/2019/07/Blueprint_for_Ocean-Climate_Action_Final.pdf



GOVERNANCE & PARTICIPATION

GLOBAL LEVEL

- Make the Global Agendas compatible (Climate, SDGs, Sendai/DRR, CBD, BBNJ) in mainstreaming to the national and sub-national levels;
- Strengthen coordination of ocean governance at the global level and linkages with the regional and national levels, and mainstreaming of climate within this;
- Stimulate active involvement of the regions and member states in Global Agendas: encourage involvement of the regions and member states in the global works (invite, make it accessible and stimulate);
- Advance and mobilize North-South and South-South cooperation for coastal and ocean governance;
- Elevate the developments at the regional and national scales;
- Encourage participation of the regional and national levels in the international networks (e.g. UN Decade of Ocean Science, NWP Adaptation Portal, IUCN, etc.);
- Encourage government-science-business partnerships for a systematic long-term oceanic cooperation;
- Encourage collaboration and knowledge sharing across SIDS regions;
- Create and strengthen mechanisms for meaningful engagement of civil society, ocean resource users, and local and indigenous communities in decision-making on global policies and agendas;
- Continuous support for Early Career Professionals to allow for inter-generational and innovative ideas for coastal and ocean governance;

REGIONAL LEVEL

- Assess and identify salient regional priorities and aspirations for the coast and ocean, particularly transboundary issues, in the face of climate change, taking into account local and traditional as well as scientific knowledge, and develop regional strategies for coordinated and collective action on these;
- Active involvement of the Regional Sea Conventions and other regional organizations in the Global Agendas and follow the global developments;
- Participate more in the international networks (e.g. UNFCCC/NWP, UNDP, UN Environment, IOC-UNESCO, UN Decade of Ocean Science);
- Focus on advancing, rationalising and coordinating relevant aspects of existing work rather than creating new processes and/or methods that further drain the capacity (e.g. of SIDS) in an already crowded and complicated governance regime;
- Act in the relevant Global networks and encourage the national-regional actions;
- Encourage strengthening national contributions to the international ocean actions;
- Facilitate strategic alliances, knowledge sharing, and project/platform development between private sectors and other stakeholders (particularly civil society and local and indigenous communities) for coastal adaption programs and blue economy development;
- Monitor relevant climate-ocean developments at global, regional and national scales;

NATIONAL LEVEL

- Support the national fulfilment of Climate Adaptation, SDGs 14 and 13 in global ocean action, to reach sustainable development, visibility and international recognition;
- Foster, encourage and maintain political willingness to address the ocean and coastal adaptation needs;
- Cooperate in bilateral actions for oceans with the countries committed to the Global Ocean Agenda;
- Establish cooperation and continued engagement and understanding between relevant Ministries (Development, Fisheries, Climate, Finance, etc.): establish coordination mechanisms across relevant national Ministries, Agencies and Departments, including participation of key sub-national representations to promote vertical as well as horizontal coordination and cooperation;
- Promote cross-sectoral collaboration in policy development and capacity building, including by involving national ministries and community groups on gender and women, health, youth, Indigenous Peoples, etc.
- Encourage the formulation of inter-sectoral ocean and coastal alliances/networks, civil society and local and indigenous communities, to propel discussions and actions toward efficient governance to address climate/ocean issues;
- Increase involvement in the regional works and related coordination across related forums;
- Develop an integrated reporting and communication channel where national and institutional representatives to global instruments (CBD, RAMSER, UNGA, Kyoto, etc) can give detailed account of their stewardships [also to help to eliminate duplicity of ideas and actions, reduce inter-agency rivalry and multiplicity of institutional mandates];
- Strengthen partnerships between the government and marine scientific communities: increase coherence between the policy-makers and scientists with regards to ocean action, coastal adaptation, and ocean observation, including the importance for decision-making at a national level;
- Demonstrate national commitment by developing a national strategy on ocean management issues, including but not limited to a national ocean strategy or a national mangrove strategy, taking into account local and traditional as well as scientific knowledge;
- Develop and strengthen mechanisms for effective engagement of civil society, women's groups, Indigenous Peoples and communities in policy development and planning;
- Launch a high-level national Ocean platform with a mandate and commitment and deliver strong partnerships (Ministries, institutes, business community, civil society, key ocean resource users, other stakeholders);
- Initiate/provide capacity to strengthen local institutions for them to perform optimally and capable of decoupling 21st century coastal and oceanic challenges;
- Include community-based and ecosystem-based adaptation approaches in laws, policies, regulations and planning frameworks governing coastal development;

SUB-NATIONAL LEVEL

- Initiate/provide capacity to strengthen local institutions for them to perform optimally and capable of decoupling 21st century coastal and oceanic challenges;
- Create mechanisms and enhance funding to facilitate sub-national multi-stakeholder assessments and adaptation/mitigation planning and action, particularly using community-based and ecosystem-based adaptation approaches that deliver additional economic and social benefits;
- Protection and conservation of coastal areas – sustainable coastal management, resilience building / strengthening;
- Give priority to co-management approach as a strategy for resources management and sharing;
- Advocate for increased political commitment to address ocean issues at the sub-national level;
- Build local institutions capacity to mediate in extra-local initiated projects;
- Build local institutions' capacity to intervene in areas such as knowledge management, on small business management, diversification, and financial management;
- Enable economic diversification;



Port of Dover, Flickr, CC BY-NC-ND 2.0



DATA & METHODS

GLOBAL LEVEL

- Strengthen the importance of linking to data use and accessibility of information for relevant adaptation policies;
- Develop/strengthen global, regional and national partnerships for ocean observation;
- Climate Change adaptation community need to inform the ocean observation community what should be observed;
- In global ocean observation focus on: 1) under-sampled key areas such as polar and coastal areas (in and around countries EEZ) and 2) and marine bio-ecosystem health;

REGIONAL LEVEL

- Reducing uncertainties on the impacts of climate change at regional level;
- Awareness of and participation in key international programmes, systems and networks;
- Strengthen data management and linking to data use for policies in the regions;
- Producing a stocktaking of the existing databases and observation programmes on climate change risks, vulnerabilities and impacts, including sex-disaggregated data where possible;;
- Foster synergies between data produced by research projects and current and future initiatives on data sharing and making data easily available and public, such as the EU adaptation clearinghouse mechanism, EEA products/services, EMODNET, etc;
- Strengthening efforts for producing data, indicators and maps on socio-economic impacts of climate change in coastal areas and the sea, including impacts on maritime sectors;

NATIONAL LEVEL

- Integrate climate considerations into underlying data for policy planning (e.g. MSP) and policy assessments;
- Encourage the development of a national coastal, ocean and climate data management plan;
- Encourage the analysis and use of existing data (particularly in the Global south) to inform ocean policies and climate change actions (standardising data and making it accessible is a key issue);
- Sustain the meteorological / hydrological / seismological services and sustain/enhance long-term monitoring programme (e.g. adaptation measures) and making it accessible to the public;
- Active and continuous investment in scientific and socio-science marine research and capturing local and traditional knowledge (scientific research should encompass all of the sciences);
- Extend measurements and databases, that are required for forecasts and long-term predictions – monitoring in new locations, and in a more coordinated and consistent way, deploying tidal gauges and underwater seismic sensors for better forecasts; monitoring of nutrients, CO₂;

- Improved understanding of combined factors, e.g. sea level rise and large tsunami inundation;
- Strengthen cooperation between the institutes to deliver integrated expertise i.e. bio-physical and socio-economic, policy/institutional;
- Encourage greater country participation and foster stronger positions within the international initiatives, programmes;

SUB-NATIONAL LEVEL

- Get a broader understanding of the basins' processes and changes as a consequence of global change and increased human activities;
- Assess to which extent information from monitoring (i.e. data collection, data use and models) is utilized in national policy reporting and in supporting the policy dialogue in the country;
- Establish a cross-institutional activity group consisting of scientific and technical experts to coordinate collaborative input to the monitoring processes: to support long-term implementation of the monitoring programme through identification of high priority actions;
- Strengthen the integration of *in-situ* data with satellite data and models as essential to provide an integrated assessment for the ocean areas (data management);
- Map and gather new data—map industry-level impact on sustainable ocean development;
- Local and traditional knowledge capture and use;

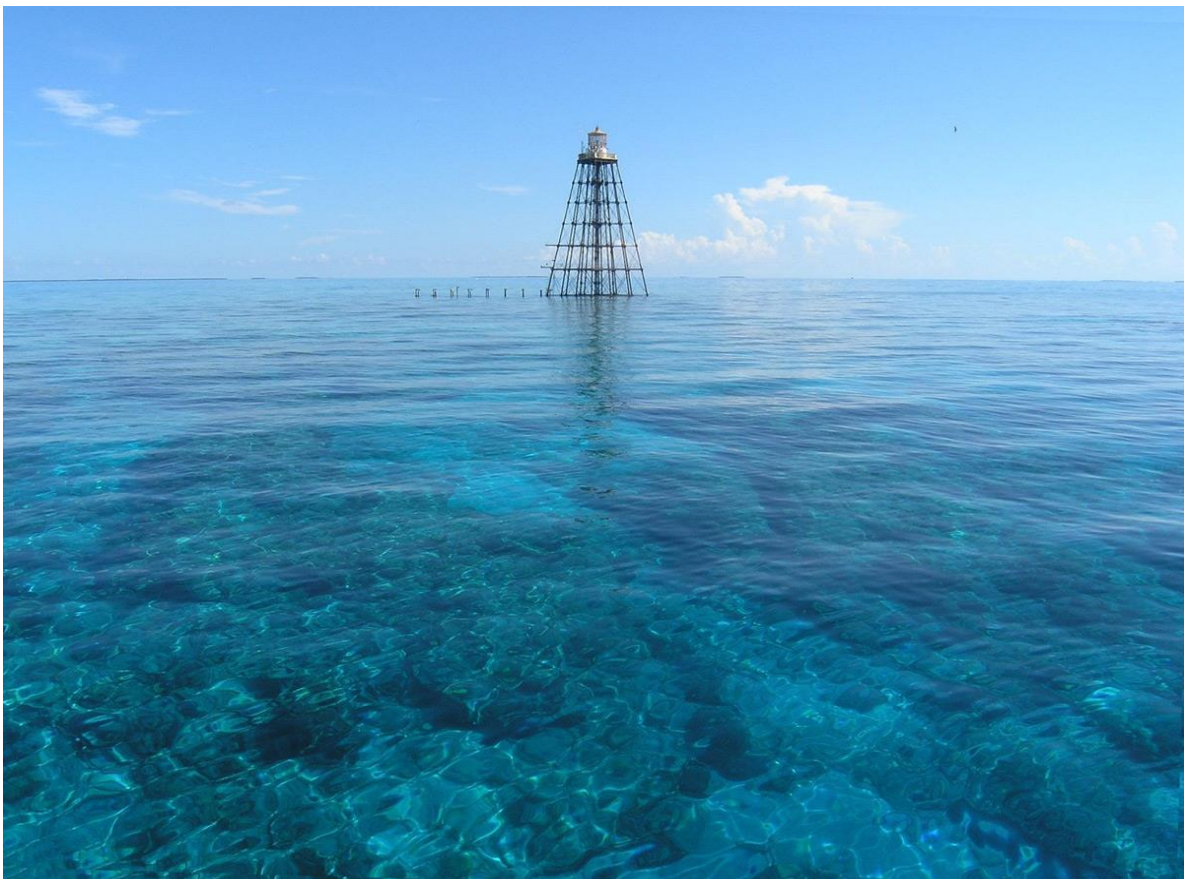


Photo from Cooperative Institute for Marine and Atmospheric Studies, University of Miami



TECHNOLOGY & INNOVATION

GLOBAL LEVEL

- Strengthen efforts for producing technologies and innovations to assess impacts of climate change in coastal areas and the sea, including impacts on maritime sectors;
- Transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries;
- Identify cost effective technologies that are needed for assessments at different spatial and temporal scales, in different regions, and for different policy purposes;
- Partnerships between the “haves” and the “have nots” to share technologies capable of fostering climate change-smart coastal/ocean management and coastal infrastructural development;

REGIONAL LEVEL

- Produce a stocktaking of the existing technologies and innovations on climate change risks, vulnerabilities and impacts that will be useful. (What does already exist and how can this knowledge be used?)
- Improve current technologies to assess the vulnerability of marine and coastal domains to climate change;
- Strengthen feedback and flows of information between researchers working on ocean technologies and policymakers;
- Reach coherence with/between on-going research projects to develop innovative technologies to measure climate change vulnerability and adaptation;
- Encourage industry-research partnerships for a systematic long-term cooperation, oceanic observation, technology development and transfer;
- For ocean observation, including for CO₂ measurements, enhance the use of commercial ships, Ferryboxes, etc.;

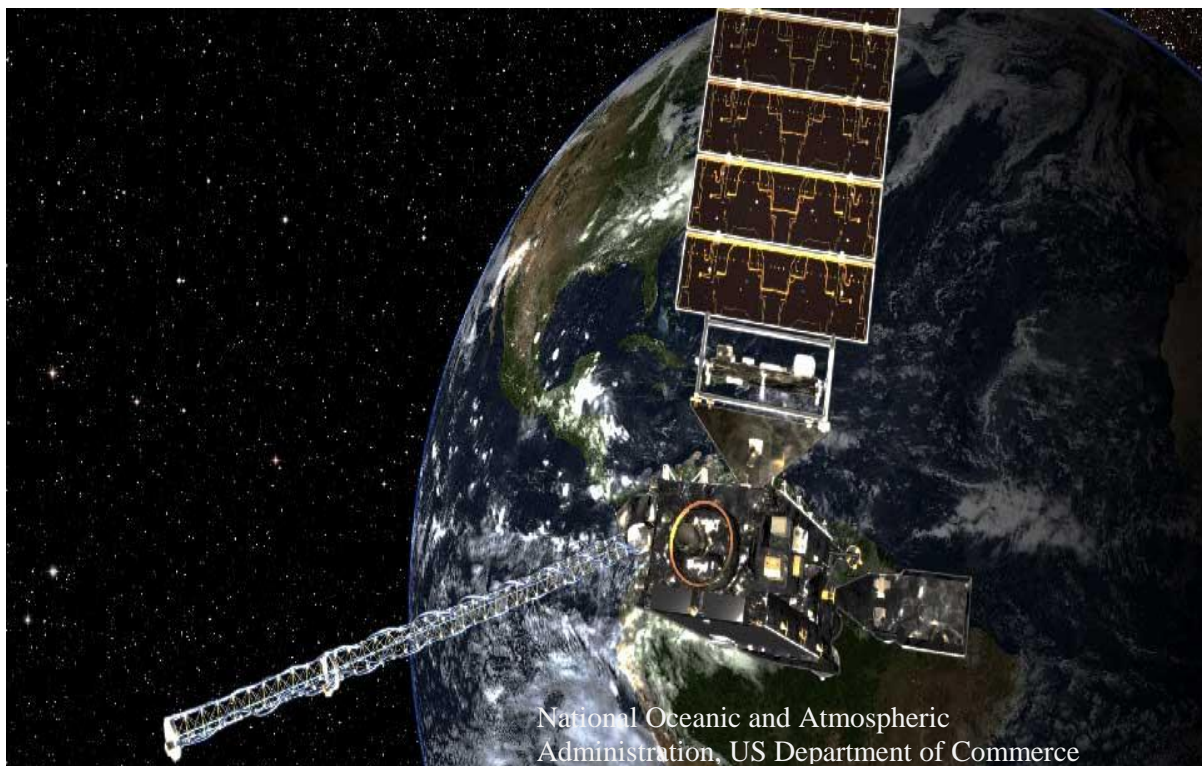
NATIONAL LEVEL

- Acknowledge the growing importance of technology and innovation in managing the sustainable development of seas and ocean responsibly;
- Engage in ocean technology development that is required for contributing to the development of blue economy and sustainable use of marine resources as well as fulfilment of Climate Adaptation and SDGs;
- Put major priority in science and technology research to realise the full potential of innovations in the ocean economy;
- Provide an enabling environment with adequate support during the early and latter stages of development of certain innovation activities, both in terms of facilitating access to finance and in accessing test facilities and demonstration sites;
- Leverage technology synergies across science disciplines and among different ocean sectors;
- Building and strengthening the partnerships with the ocean business communities;

- Adopt “disruptive” technologies, new collaborative and open innovation mechanisms for blue economy development;
- Develop/strengthen national real-time operational ocean forecasting and impact based systems/forecast⁵⁸;
- Support and strengthen existing and mandated national institutions/platforms/networks;

SUB-NATIONAL LEVEL

- Apply technologies that measures coarse-scale coastal and marine vulnerability to assess policy effectiveness / efficiency of climate change actions;
- Demonstrate technologies to improve marine spatial planning and conservation of coastal ecosystems;
- Extend long-term monitoring with modern high-resolution sensor measurements;
- Support development of innovative technologies by local communities and enterprises, and support the adoption and adaptation of technologies appropriate to local contexts and scale;



National Oceanic and Atmospheric
Administration, US Department of Commerce

⁵⁸ <https://mhews.wmo.int/session-2>



RESTORATION & PROTECTION

GLOBAL LEVEL

- Promote Global Agendas related to restoration, e.g. The UN Decade on Ecosystem Restoration 2021-2030, to scale up the restoration of degraded and destroyed ecosystems in order to fight the climate crisis and enhance food security, water supply and biodiversity;

REGIONAL LEVEL

- Use the Large Marine Ecosystem framework for coordinated interactive governance and action, particularly addressing transboundary issues;

NATIONAL LEVEL

- Support regional/international actions for the priorities important for the maintenance of healthy oceans: e.g. implementation of ocean acidification indicator methodology as a good practice (SDG 14.3.1), monitoring of ocean acidification, monitoring for better process-based understanding, monitoring of faunal and ecosystem response to ongoing acidification, monitoring of mangrove areas, monitoring of the coral reefs, monitoring of bottom water oxygenation, monitoring of marine litter, etc.;
- Develop the national marine platforms including MPAs and other protected areas;
- Conduct biogeochemical studies in the territorial waters; obtain data for better understanding and predicting the impact of human activities on ocean ecosystem functioning and the effect this may have on the Earth's climate - as well as in support of SDGs 14 and 13;
- Improved knowledge and understanding of how HAB and climate change stressors interact with aquatic life in marine and fresh water ecosystems;

SUB-NATIONAL LEVEL

- Support working with Nature-based Solutions for adaptation by incorporating NBS for adaptation into adaptation and development planning as part of a strategy to meet adaptation goals;
- Support adaptation initiatives in local communities and ecosystem stewardship by resource users (e.g. women, youth, Indigenous Peoples, fisherfolk, tourism sector) and build capacity to deepen and scale out efforts;
- Demonstrate technologies to improve restoration of coastal ecosystems;



CAPACITY-BUILDING & EDUCATION

GLOBAL LEVEL

- Support educational efforts and community participatory and gender-responsive research efforts at every scale;
- Provide logistical and financial support for education and community-based participatory and gender-responsive research;
- Publicize successful educational programs and community-based participatory and gender-responsive research efforts;
- Support knowledge sharing and partnerships across regions, including engagement by civil society, resource users, and local and indigenous communities;

REGIONAL LEVEL

Actors: UN Regional Commissions, the Regional Sea Conventions and other regional organizations, stakeholders

Actions:

- Build the capacity of regional institutions to coordinate work on regional and trans-boundary issues and to support national efforts;
- Showcase solutions and share experience by hosting and promoting international ocean events with an emphasis on proper knowledge transfer and skills;
- Provide opportunities for members of vulnerable groups, including women, youth and Indigenous Peoples, within regions to meet, deliberate, and build solidarity across national boundaries;

NATIONAL LEVEL

Actors: national governments, national institutes, stakeholders

Actions:

- Strengthen engagement of civil society and local communities and use local and traditional knowledge in national policy development and planning (e.g. involving women's groups, Indigenous Peoples, and youth associations);
- Adapt existing legal and policy frameworks to empower community-based co-management of coastal and ocean resources;
- Mainstream community-based adaptation into government policy or planning processes;
- Conduct systematic studies of cutting-edge community deliberation and decision-making methods and work to adapt existing methods for use in the areas of ocean/climate literacy and adaptation to climate change;
- Experiment with different models of community engagement and participatory decision-making to determine which are most suitable for the climate change adaptation context;
- Provide opportunities for genuine, not merely formal, participatory decision-making, including through active involvement and leadership with women, Indigenous Peoples and youth;

SUB-NATIONAL LEVEL

Actors: local authorities, local communities, stakeholders

Actions:

- Provide communities the basic technical skills needed to begin formulating adaptation problems and potential solutions;
- Invest substantial time and resources in education and community participation;
- Give voice to the concerns of those most vulnerable from the impacts of climate change, including women and Indigenous Peoples, and those that will have to radically change their lifestyles who are on the front lines of adaptation;
- Build solidarity among local communities, especially those with varying levels of vulnerability to the impacts of climate change;
- Conduct locally-oriented empirical studies of the effectiveness of community-based adaptation initiatives, community-based participatory research projects, and deliberative, participatory governance efforts;



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FINANCE & FUNDING AREA

GLOBAL LEVEL

- Enhance long term, consistent funding and financial support; including through blended finance approaches;
- Enhance mechanisms for civil society to access and benefits from global climate financing, e.g. use of Green Climate Fund readiness support to engage and build capacity of civil society;

REGIONAL LEVEL

- Organize and provide long-term sustainable funding for ocean action and adaptation, e.g. for supporting sustained long-term monitoring in international waters;
- Contributing to funding agencies and influencing international research priorities and project definition- regional groups contributing funds through regional trust funds or other groupings;
- Enhance funding and other support to address transboundary issues e.g. shared fisheries, sargassum influxes, MPA networks;

NATIONAL LEVEL

- Parties and Non-Part Stakeholders in a position to do so, to make financial commitments to funding agencies like the GCF for adaptation and contribute to influencing international knowledge priorities;
- Provide incentives and subsidies for adoption of technologies for climate mitigation and adaptation;

SUB-NATIONAL LEVEL

- Create mechanisms to support flows of climate financing to civil society, resource users and local and indigenous communities, including micro-financing for community small and micro-enterprises, to build their resilience to climate change;



JPI Oceans, Flickr, CC BY-NC 2.0



7. A Step Forward

Recent assessments of the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (2019) have shown that the impacts of climate change on the ocean and the coastal zones will be increasingly disruptive at all spatial scales. The countries most affected by climate change are usually the ones least capable of dealing with them, therefore adaptation efforts in all countries are crucial. In view of climate change projected increased risks, there is an increasing sense of urgency for adaptation knowledge sharing and co-designing actions in closing knowledge gaps and making action pledges on the ocean, coastal areas and ecosystems to protect and reduce the vulnerability.

7.1. National ocean consideration and adaptation

Many countries are considering how to best integrate ocean-related components into Nationally Determined Contributions (NDCs) from an adaptation and mitigation perspective in order to minimize the adverse effects of climate change on the ocean and to contribute to its protection and conservation with bolsters resilience of communities⁵⁹. To assist countries in their reflection for the 2020 NDC revision cycle, the Because the Ocean initiative published an “Ocean For Climate” report on ocean-related measures to be included in NDCs, national adaptation plans (NAPs), Adaptation Communications and other climate strategies. In addition, opportunities for increasing ocean action in climate strategies have been recently published in The Ocean Solutions Initiative’s Policy Brief⁶⁰ (November 2019) where 18 ocean-based measures to support climate policies and the revision of NDCs in the areas of mitigation and adaptation were assessed.

The majority of ocean-inclusive NDCs focus on climate change impacts and adaptation needs in marine areas. Some NDCs provided specific plans to address these impacts, whereas others include them more generally as adaptation needs. In their NDCs, least developed countries (LDCs) and SIDS largely look to the international community to provide the financial support to meet their NDC goals. Parties also include in their NDCs marine research needs, e.g. improve scientific climate models and marine observations; strengthen the capacity of local marine and resource management institutions. Regarding references to the ocean in long-term climate strategies under para 19, art 2 of the Paris

⁵⁹ <https://escholarship.org/content/qt5255342w/qt5255342w.pdf>

⁶⁰ Gattuso, J.-P. *et al.* (2019). Opportunities for increasing ocean action in climate strategies. IDDRI, *Policy Brief* N°02/19.

Agreement, twelve countries - Benin, Canada, the Czech Republic, Fiji, France, Germany, Japan, Mexico, Republic of the Marshall Islands, the United Kingdom, the United States and the Ukraine - have officially communicated long-term strategies to the UNFCCC. Of these, Fiji, the Republic of the Marshall Islands, Canada, Japan, Mexico and the United Kingdom highlight the ocean as a key element of their climate strategies.

National governments have the primary responsibility for developing national adaptation strategy, including the prevention and recovery strategies, by establishing regulatory and incentive-based mechanisms to ensure resource allocation. Coherence of multiple global agendas and their link to the NAPs is in this process crucial to enable the countries implement the ambitious goals and targets as agreed in the Paris Agreement, the Sustainable Development Goals, and the Sendai Framework for Disaster Risk Reduction⁶¹. Implementation of adaptation measures should be backed up with identified needs in the countries' NAPs or NDCs. NAPs and NDCs also need to be effectively linked with priorities in sectoral policies and plans.

7.2. Local adaptation

Communities need to be well-acquainted with the dangers they face from a changing climate and need to be given a voice in the planning process. Many local communities, especially those most vulnerable to climate change such as women and Indigenous Peoples, are excluded from the adaptation planning and resilience process. The greatest knowledge gaps in this domain involve how to translate the knowledge of the scientific and planning communities into the local context, and how to translate and integrate local and traditional knowledge with scientific knowledge, creating opportunities for genuine dialogue of all involved, and respecting and integrating local knowledge, priorities, experiences and needs. Increasing technical adaptation capabilities must work in tandem with effective communication to enhance awareness and influence change in policy and practice at all levels. In general, capacity-building must ensure that necessary interventions for climate adaptation can be recognized, those interventions are carried out with consent, and that they are appropriate for local circumstances. Countries and organizations that lack popular legitimacy, even if they have technical capacity, they will not be effective. For this reason, capacity building needs to expand beyond the technical, and focus on strengthening the public sector, civil society, local organizations, women's groups, and less formal networks of people.

It is essential for building resilience capacity that governments learn how to listen and to share their knowledge and plans with the communities they serve, as well as helping those communities to engage in self-study to make sure technical knowledge translates appropriately to local context. Countries and communities need the skills and expertise to articulate how climate change will affect them and their proposed solutions, taking into account the best science and technology, and their knowledge of local circumstances. This is difficult for any domain, but all the

Adaptation to climate change may require substantial changes to everyday life including changes to diet, water use, transportation, and place of residence. At the local community level, for example in South American coastal and island cities and towns, there is already a recognition that livelihood depends on oceans via tourism and fishing. In some ways, very small, short-term changes to ocean conditions are kept track of — people there, for example, are aware of the ENSO phenomenon. This does not translate very well, however, to long slow changes such as those imposed by global warming such as sea level rise (SLR). Local ability to seek out the growing body of work on climate change adaptation is still limited.

⁶¹ UNISDR Sendai 2015

more so since climate change effects are happening slowly and the relevant changes are hard to recognize. In the adaptation process, governments at all levels must find the best ways to increase participation of the most marginalized including women, minorities, and Indigenous People. In this context, the role of integrating local and Indigenous knowledge is important, which is directly relevant for some of the adaptation measures, e.g. nature-based solutions (NBS). One such example is the Mangoro Market Meri program led by women for women across Papua New Guinea (PNG) to manage their mangroves sustainably for: Education and awareness; Food security; Income opportunities; Storage of 'blue' carbon; and Protection of coastal communities from sea level rise and storm surge. Supported by The Nature Conservancy (TNC), it is a platform for women to generate income based on sustainable management of their mangroves. Potential economic opportunities include: Building local markets for sustainably harvested mangrove products such as shellfish and mud crabs (short-term); Exploring potential for ecotourism (medium-term); Preparing to engage in blue carbon markets (long term).⁶²

7.3. The regional perspective

The regional level is identified as an important intermediary between international processes and national decision-making, and the regional level is well-placed to translate global goals into concrete actions on the ground. The regional level is acknowledged for its role in breaking long-term perspectives into more tangible goals⁶³. The importance of strong regional identities, appropriate science-policy interfaces, and bridging the gap between different stakeholders is highlighted. For this reason, the regional level communication and narratives are crucial to make the case for ocean among different stakeholders, and regional frameworks may assist with development of indicators, e.g. the Regional Sea Conventions. One of the key outcomes from the Marine Regions Forum (2019) is the power of regional organisations, e.g. Regional Seas initiatives, have the opportunity to support national efforts and link these back to multilateral requirements. The importance of regional approaches to addressing transboundary and shared issues and to share knowledge and capacity cannot be over emphasised.

7.4. Adaptation knowledge gaps and needs

Over the last decade, ocean and coastal adaptation knowledge has grown both in the practitioners and scientific communities worldwide. There are worldwide efforts in adaptive planning and management as proactive actions to address climate change impacts. Nature-based solutions for adaptation in particular have emerged as a core concept given their benefits for ecosystems, people and climate. The knowledge gaps differ across national and local levels and types of adaptation as well as mitigation co-benefits to adaptation efforts. It is therefore emphasized to leverage the adaptation knowledge at all governmental levels and to bridge national action and local level knowledge and needs. For this, mapping of adaptation knowledge together with gaps and needs is important at the regional scale.

The biggest difficulty for the governments, observed in many regions, is to move more rapidly toward adaptation action. The challenge lies in getting countries adapted to climate change with a sense of urgency in mind and the appropriate adaptation knowledge to enable actionable adaptation planning and implementation by the countries. For this reason, the UNFCCC NWP brings together NWP partner organizations, Parties, experts and relevant expert organizations for knowledge sharing and co-

⁶² <http://naturesleadingwomen.org/women/papua-new-guinea/>

⁶³ <https://enb.iisd.org/download/pdf/sd/enbplus186num18e.pdf>

designing actions in closing knowledge gaps and make action pledges on the ocean, mobilizing support for implementing transformative actions, and supporting adaptation actions at all levels.

8. The UNFCCC NWP Knowledge-To-Action Hub

The NWP Knowledge-to-Action hub shares knowledge and experiences to help the governments to identify and implement appropriate solutions as well as accelerate and upscale the needed adaptation.

The 13th NWP Focal Point Forum will bring together NWP partner organizations, Parties, experts and relevant expert organizations for knowledge sharing and co-designing actions in closing knowledge gaps and make action pledges on the ocean. The forum will facilitate collaboration and partnerships among diverse groups of participants in order to translate the key findings into concrete adaptation actions.

The forum will initiate actions to close knowledge gaps on the thematic area of the ocean and coastal zones and will inform Parties on outcomes. The knowledge gaps will be discussed as well as needed actions towards helping countries in adaptation planning and implementation. The objective is to continue partnerships on oceans beyond the forum to advance the work in this thematic area by the UNFCCC in 2020. Participants will collaborate on co-designing actions and mobilizing support for implementing transformative actions, working with relevant constituted bodies under the Convention, and supporting adaptation actions at all levels.

Thematic information on the ocean together with the good practices will be continuously available on the UNFCCC Knowledge-to-Action NWP Adaptation Knowledge Portal.

The objectives of the focal point forum:

- Enhancing the engagement of experts and expert organizations, including those from developing countries and those working on national adaptation plans;
 - Providing an interactive space for information-sharing and the informal exchange of views among NWP partner organizations, Parties and other relevant organizations,
 - Facilitating collaboration and partnerships among NWP partner organizations, Parties and other relevant organizations
 - Informing future activities to be undertaken under the NWP, in a way that supports the potential role of the NWP in the implementation of the Paris Agreement, particularly on issues related to adaptation
 - Taking stock of the practical ways in which knowledge shared through the NWP has been used in the past and using this to set out ideas for future work.
-

The UNFCCC KNOWLEDGE-TO-ACTION HUB

Established by the Conference of Parties (COP) in 2005, the Nairobi Work Programme (NWP) assists all Parties, in particular developing countries, including the Least Developed Countries (LDCs) and Small Island Developing States (SIDS), in (i) improving their understanding and assessment of climate change impacts, vulnerability and adaptation; and (ii) making informed decisions on practical adaptation actions and measures to respond to climate change on a sound scientific, technical and socioeconomic basis, taking into account current and future climate change and variability.

The NWP, the UNFCCC's authoritative Knowledge-To-Action Hub, synthesizes the best available information on all aspects of vulnerability and adaptation, disseminates its findings widely and cultivates high-impact partnerships to close critical knowledge gaps and accelerate action around the world.

The NWP directly responds to knowledge needs identified by Parties, particularly developing countries, who negotiated our thematic areas of work under the UNFCCC. We also provide technical assistance to constituted bodies under the Convention, including the Adaptation Committee (AC) and the Least Developed Countries Expert Group (LEG). For example, in collaboration with the LEG, we have supported many of the world's LDCs formulate and implement NAPs that strengthen the resilience of vulnerable communities, groups and ecosystems. Together with the LEG, we are mobilizing inputs from our partners for effective implementation by publishing guidelines for Parties, co-organizing technical sessions like "Assessing progress in adaptation in vulnerable groups, communities and ecosystems," and developing indicators to evaluate progress of adaptation moving forward.

Critical knowledge gaps centre around the following thematic areas, identified by Parties to the UNFCCC:

- Agriculture and food security
- Ecosystems, water, wetlands, forests and grasslands
- Drought, water scarcity and land degradation neutrality
- Oceans, coastal areas and ecosystems, including mega deltas, coral reefs and mangroves
- Slow onset events
- Extreme weather events, such as heat waves, flash floods, sand and dust storms, cyclones and heavy precipitation
- Economic diversification
- Livelihood and socioeconomic dimensions in relevant sectors, such as tourism
- Health
- Human settlements, cities and urban systems
- Rural systems and communities
- Indicators of climate adaptation and resilience

The NWP engages a broad network of partner organizations, from universities to non-profit organizations, to close critical knowledge gaps and help Parties transform their ambitious adaptation commitments into action. With diverse thematic, sectoral and regional experience, our partners co-design and implement effective, evidence-based resilience activities that directly respond to the needs of national governments and UNFCCC constituted bodies, such as the AC and the LEG.

Find out more about the UNFCCC Action-to-Knowledge Hub, NWP thematic work on oceans and other initiatives: <https://spark.adobe.com/page/TpuJ4xeNwFEeY/>

The UNFCCC KNOWLEDGE-TO-ACTION HUB

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