OA ALLIANCE
INTERNATIONAL ALLIANCE TO COMBAT OCEAN ACIDIFICATION

UNITED NATIONS FOUNDATION

OA ACTION PLAN
LEADERSHIP CIRCLE

ACCOUNTING FOR OCEAN ACIDIFICATION ACROSS

NATIONALLY DETERMINED CONTRIBUTIONS & NATIONAL ADAPTATION PLANS

OCEAN ACIDIFICATION TRENDS CAUSED BY ATMOSPHERIC CARBON DIOXIDE EMISSIONS

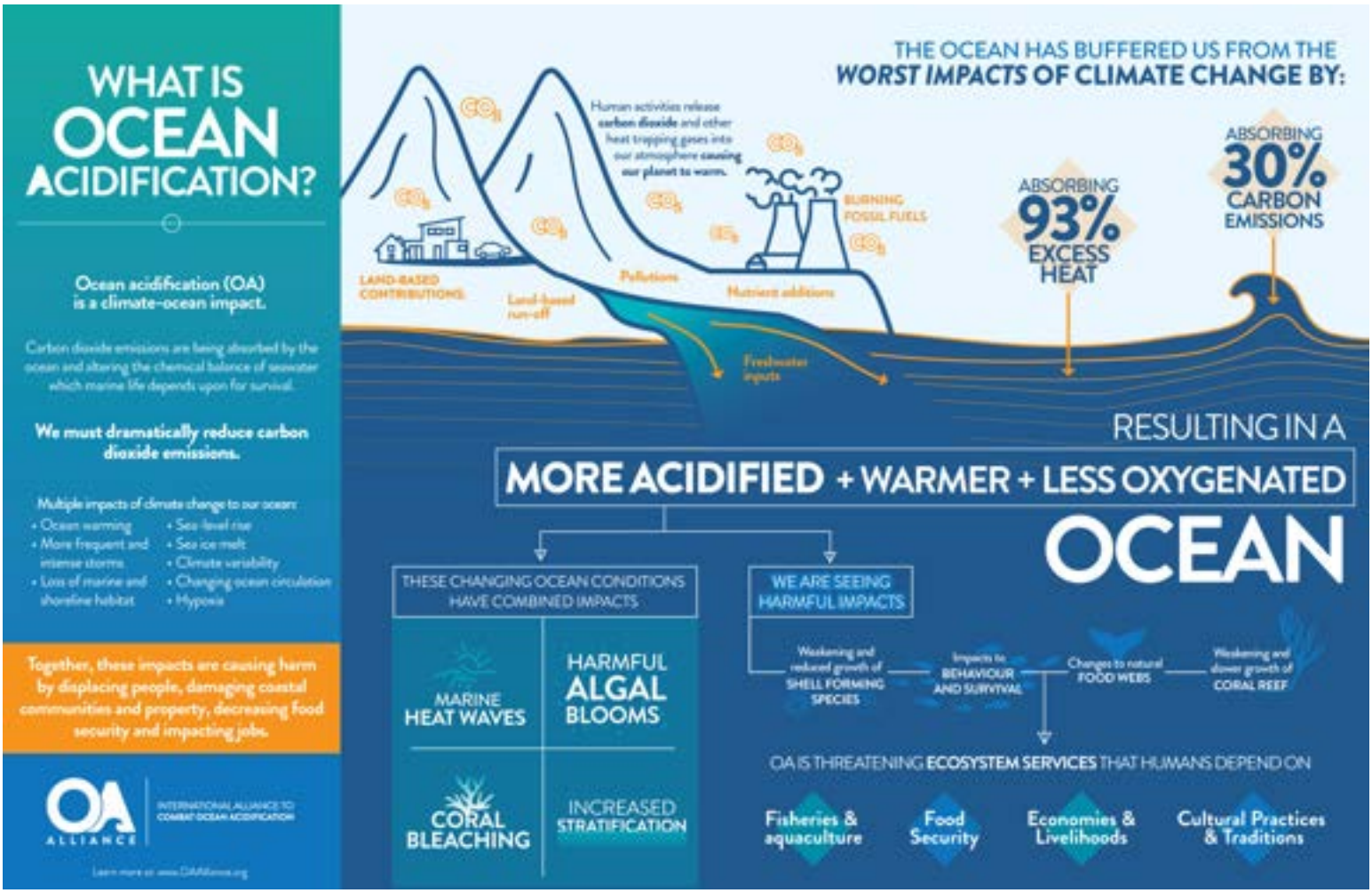
- The IPCC Sixth Assessment Report (AR6) states that it is "virtually certain" that global acidification of the ocean surface has been driven by anthropogenic carbon dioxide (CO_2) emissions, causing a 40% increase in acidity (IPCC, 2022; Gattuso, J.-P. et al, 2015).

- As we continue to release CO_2 into the atmosphere through activities such as burning fossil fuels, the ocean is forced to absorb more and more carbon.

- The most recent UN Intergovernmental Panel on Climate Change (IPCC) AR6 Report shows that ocean acidification will continue to increase in the 21st century at rates dependent on future emissions of carbon dioxide and greenhouse gases (GHG).

- Projections for the end of this century indicate that our global ocean's surface waters could be 150 times more acidified than at the start of the Industrial Revolution (Gattuso, J.-P. et al, 2015; Magnan A. et al, 2015). This is far beyond the conditions to which most marine species are adapted.

- **In the future – if we don't take actions to reduce CO_2 – ocean acidification will increase in intensity, extent, and duration.**



IMPLICATIONS FOR MITIGATION AND ADAPTATION AGENDAS AT THE UNFCCCC

- The UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) has recognized OA as an emerging issue relevant to the UNFCCC. Additionally, OA has been acknowledged as a slow-onset climate event by the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (United Nations, 'FCCC/CP/2010/7/Add.1 - Report of the Conference of the Parties on Its Sixteenth Session). However, more must be done to act on this well-established trend and its consequences.

- The IPCC reports with high confidence that ocean warming, ocean acidification and deoxygenation have already affected the net primary production of our ocean, including species biomass, composition, and distributions, leading to changing food production, including shellfish aquaculture and fisheries in some regions (IPCC, 2019; 2022).

- Ocean acidification threatens biodiversity and adversely impacts commercial, recreational, subsistence, and ceremonial shellfish harvest and other seafood species around the world like crab, lobsters, shrimp, clams, mussels, sea urchins, corals, squid and some species of plankton and fish (Johnson, 2016; Kroeker, 2013, Cheung et al. 2022).

- Scientific research also demonstrates that acidification can reduce growth rates in some species (Sampaio et al. 2020) and can impact plankton which in turn affects entire marine food webs.

- Ocean acidification is adversely affecting cold water corals, critical habitats for regional fisheries. (McGovern et al., OSPAR OA Assessment, 2023). Some studies predict that by 2050, coral reefs will dissolve faster than they can build their skeletons (Eyre, 2018). Loss of coral reefs will mean loss of critical habitat for important seafood—this has impacts for food security and jobs and livelihoods.

- Such a decrease in seafood production and seafood availability carries especially significant impacts for coastal communities who rely on marine seafood for primary protein (IPCC, 2022, p. 10) and well as small scale and large-scale fisheries.

- Seafood contributes to a greater share of animal protein intake in low-income countries than in high-income countries (FAO, 2022), highlighting the disproportionate vulnerability of seafood dependent and developing countries.

- These trends are especially alarming when paired with the Food and Agriculture Organization of the United Nations (FAO) 2022 report, "State of the World Fisheries and Aquaculture" which shows that global consumption of aquatic foods has increased significantly, with the world now consuming more than five times the quantity consumed nearly 60 years ago.

- Impacts of ocean acidification trends should not be defined only to food security, but also marine ecosystem's ongoing ability to adapt under increased pressure from climate change.

- OA trends undermine marine ecosystems' ability to offer effective ocean mitigation and conservation strategies like blue carbon ecosystems and habitat restoration, marine protected areas, nature-based solutions, and climate-resilient fisheries and aquaculture.

- With reduced capacity of marine ecosystem services, the adaptive capacities of vulnerable communities and societies will be significantly undermined by the combined effects of ocean warming and ocean acidification.

- This is particularly the case where the affected communities and societies also face vulnerabilities associated with poverty or ongoing sustainable development.

These combined impacts have implications for reaching goals and targets outlined in the Paris Agreement. For Example, Article 2 of the UNFCCC states that measures to reduce GHG emissions must be taken to "ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

Article 2 of the UNFCCC additionally states, that measures to reduce GHG emissions must be taken "at a level and within a timeframe to allow ecosystems to adapt naturally to climate change."

Ongoing trends and impacts of ocean acidification must be measured, mitigated and responded to in order to achieve these stated goals and targets of Paris Agreement that aim to protect food security and marine ecosystem function for human communities world-wide.

IMPLICATIONS FOR CAPACITY BUILDING, TECHNICAL TRANSFER AND FINANCING NEEDS

- In order to identify the most suitable mitigation and adaptation measures, Parties must have a more comprehensive stocktake of regional/ local information that will allow governments to prioritize and evaluate their risks and required response strategies.
- This is especially true across marine dependent, developing regions with little data on local trends and impacts of ocean warming, acidification, and deoxygenation.
- While the IPCC can supply information on global trends, there is limited data and information about the impacts of climate-ocean change on locally relevant seafood species, posing barriers to equitable or robust adaptation planning, risk assessment, and adaptation response. (IPCC, 2022).
- Internationally, 70% of all ocean acidification knowledge generation is conducted across North American and European countries (Tilbrook B., 2019). Few regions in the world have access to the technology and institutional capacity to support robust adaptation, like those strategies outlined across the IPCC or across the UN Sustainable Development Goals (Polejack A., 2021)

To fully realize effective responses to ocean acidification, the UNFCCC must outline a process for financing and strategically closing these information gaps with a priority towards measures that directly support food security and marine ecosystem function at regional and local sales.

UNFCCC has existing financial mechanisms that can be activated to enhance strategic investments in monitoring, science, and research in helping countries characterize and respond to impacts of ocean acidification.

Climate finance mechanisms must serve as incubators for projects that build technological capacity for short-term and long-term observations of local conditions, enhance risk assessments, and help Parties evaluate the potential for OA mitigation and adaptation strategies.

SUPPORTING COUNTRIES IN MITIGATION AND ADAPTATION TO OCEAN ACIDIFICATION AT THE UNFCCC

The decision at COP25 called for the first ever UNFCCC Ocean and Climate Change Dialogue for Parties and civil-society to discuss options for strengthening ocean mitigation and adaptation across the UNFCCC and other relevant UN frameworks.

The decision at COP26 called for a reoccurring Ocean and Climate Change Dialogue to be held annually in June as part of the UNFCCC SBSTA.

Importantly, the Dialogue provides a space to discuss needed actions, drawing upon the knowledge and scientific findings from IPCC and the submissions from Parties and non-Party stakeholders.

A review of the 47 submissions (20 submitted by Parties and 27 by non-Parties) made to the 1st Ocean and Climate Dialogue show that ocean and ecosystem impacts were more frequently considered by non-party submission than by Party submissions, and that OA was mentioned in two-thirds of all submissions, the second most mentioned behind warming. Food security was mentioned by 72% of submissions.

This means that increased guidance on ocean and coastal mitigation and adaptation measures are needed across the UNFCCC. Further, enhancing regional knowledge of ocean and coastal risks and impacts caused by GHG and CO_2 will help Parties choose the most appropriate mitigation and adaptation strategies, alongside the capacity building, technical transfer, and financing needs to implement them.

Informal summaries of previously held Ocean and Climate Dialogues reveal, there is a need to:

- Socialize and share information on cross cutting issues.
- Support Parties in implementing ocean inclusive NDCs/ NAPs.
- Further integrate ocean issues into formal processes and appropriate mechanisms of UNFCCC.

The Global Stocktake (GST) was conducted in 2023 at COP28, and includes ocean and marine elements. The GST makes explicit references about the need to safeguard food security, particularly food production systems that are vulnerable to the impacts of climate change.

It notes the importance of ocean and coastal ecosystems as both carbon sinks and as vital resources offering economic, social, and environmental benefits that will require adaptation and resilience building strategies to maintain.

Parties are called to preserve and restore oceans and coastal ecosystems and scale up ocean-based mitigation action. Significantly, the GST requests all Parties conduct up-to-date assessments of climate risks and vulnerabilities to inform their National Adaptation Plans by 2030, undertaking efforts to improve relevant observing, data and information by 2027.

Moving forward, it is critical to include global climate observing system and global climate indicators that relate to ocean and coastal change across the Global Stocktake to allow for more comprehensive assessments and actions.

The Global Goal on Adaptation (GGA) framework was decided at COP28 (UAE Framework for Global Climate Resilience) and highlights the key areas that will require adaptation action in all countries while also laying out overarching global targets to help guide countries in developing and implementing adaptation plans.

By COP30 in 2025, Parties should agree on specific, measurable indicators to track on-the-ground action and measure progress toward achieving the targets in the UAE Framework for Global Climate Resilience— both will be critical in driving national efforts on adaptation and resilience, strengthening support for adaptation action, and informing assessments of future financing needs.

The UAE Framework for Global Climate Resilience incorporates a number of ocean, coastal and marine aspects including the need for achieving climate-resilient food production, reducing climate impacts on ecosystems and biodiversity, and accelerating the use of ecosystem-based adaptation and nature-based solutions, including through management, restoration and conservation of marine and coastal ecosystems.

The GGA also reinforces the need for all countries to conduct climate risk and vulnerability assessments by 2030, and places extra emphasis on the need for national monitoring, evaluation and learning to inform place-based adaptation strategies.

UNFCCC mechanisms and bodies can be leveraged to ensure adequate and equitable investments in information, capacity building and technology transfer that result in better preparedness, mitigation, and adaptation choices for all.

ACTIONS FOR PARTIES TO TAKE NOW ACROSS NDCS AND NAPS

Parties have outlined their GHG and carbon dioxide emissions reduction targets across their Nationally Determined Contributions (NDCs).

Each country's NDC outlines its efforts to reduce national emissions and adapt to the impacts of climate change, taking into account domestic circumstances, capacities and needs (Paris Agreement, Article 4).

The National Adaptation Plan (NAP) process was established under the Cancun Adaptation Framework (CAF) in 2010.

The process encourages Parties to formulate and implement NAPs as a means of identifying medium- and long-term adaptation needs and developing and implementing strategies and programmes to address those needs. It is a continuous, progressive, and iterative process that follows a country-driven, gender-sensitive, participatory, and fully transparent approach.

NAPs have two primary objectives: (1) reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience; and (2) to facilitate the integration of climate change adaptation into relevant new and existing policies, programmer, activities, and budgets within all relevant sectors.

The following is a guide for Parties to better account for ocean acidification across Nationally Determined Contributions and National Adaptation Plans, leading to improved leveraging of existing UNFCCC mechanisms for mitigation and adaptation.

NDC INCLUSION	WHY
Include regional trends of ocean acidification as a reason for accelerating mitigation measures by all Parties.	This will help accelerate adoption and deployment of traditional carbon mitigation targets like transition to 100% renewable energy sources, improved energy- efficiency of buildings, and electrification of the transportation sector, aviation sector and marine shipping sector.
Include ocean-based mitigation strategies like off-shore wind and wave energy.	This will help mitigate ocean acidification.
Include blue carbon ecosystems (like mangroves, salt marshes and some seagrasses) and accepted accounting of carbon sequestration associated.	This will help sequester carbon dioxide and remediate ocean acidification.
Include conservation and restoration of marine ecosystems and coastal habitats (mangroves, seagrass, salt marsh and kelp forests).	This will help remediate or buffer against impacts of acidification in nearshore coastal waters by raising the pH levels in areas nearby the submerged ecosystems. This may improve the growth and survival of species that are sensitive to ocean acidification (Unsworth et al., 2012; Chan et al., 2016).

NDC INCLUSION	WHY
Include the need for increased carbonate chemistry monitoring when evaluating ocean-based mitigation strategies.	Additional carbonate chemistry monitoring will help parties evaluate ongoing mitigation strategies like blue carbon sequestration, marine protected areas, and marine nature-based solutions to climate change.
Include the need for increased carbonate chemistry monitoring, evaluation and reporting of emergent marine carbon dioxide removal strategies.	This will help evaluate the role of marine carbon dioxide removal strategies in mitigation and remediating ocean acidification.
Include the need for equity, cooperation, and inclusive decision making with local communities and Indigenous People across all projects related to ocean-based mitigation.	This will recognize Tribal sovereigns and Treaty rights as well as the inherent rights of Indigenous peoples in decisions related to ocean-based mitigation.

NAP INCLUSION	WHY
Include ocean acidification as a threat to food security and delivery of marine ecosystems services.	This will highlight the relationship between ocean acidification and responsibilities under the UNFCCC to preserves food security and ecosystem function.
Include ocean acidification as a necessary indicator across a range of universally accepted early warning systems, climate change information services strategies and risk indexes.	This will help point to capacity building, technical transfer, and financing needs to measure ocean acidification. This will help develop a regional or national baseline for measuring ocean acidification. In the future, it will improve climate risk assessments, disaster risk management and recovery strategies, and climate change information services. In the future, it can help predict corrosive conditions.
Include a list of keystone seafood species and ecosystems that are most impacted by ocean acidification in your region.	This will highlight which species and ecosystems are most significant to food security in your region or country.
If unknown, include a list of keystone seafood species and ecosystems that should be studied to understand their vulnerability and adaptative potential.	This will indicate the capacity building, technical transfer, and financing needs for ongoing research about species/ ecosystems vulnerabilities and suitable adaptation strategies.
Include the need for enhanced aquaculture and mariculture adaptation techniques to respond to ocean acidification.	This will indicate the capacity building, technical transfer, and financing needs for suitable adaptation strategies.

ACTIONS THAT SHOULD BE TAKEN ACROSS UNFCCC MECHANISMS

GLOBAL STOCK TAKE	WHY
In the next GST, include indicators of ocean warming, ocean acidification, sea level, Arctic and Antarctic Sea ice extent as scientific measures of the Earth's energy imbalance.	Improve global climate observing systems and global climate indicators that relate to ocean and coastal change. Ocean acidification should be considered a relevant metric when assessing appropriate timelines, trajectories, and funding for mitigation and adaptation action across the UNFCCC to "ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner" as called for by Article 2.

UAE FRAMEWORK FOR GLOBAL CLIMATE RESILIENCE	WHY
Suggest ocean acidification as an indicator for inclusion in the indicator framework. This could be tied to targets related to food and agriculture or livelihoods sectors. Voluntarily include ocean acidification as an indicator within national adaptation communications and components, climate vulnerability and risk assessments.	This will ensure assessments of climate hazards, impacts and exposure to risks and vulnerabilities under the GGA adequately measure ongoing impacts caused by GHG and CO_2 emissions. This will help promote adaptation measures to ocean acidification under planning and implementation processes of GGA.

OCEAN AND CLIMATE DIALOGUE	WHY
Create a working group providing guidance to Parties in deploying and evaluating ocean-based mitigation projects.	This will help Parties identify and report the capacity building, technical transfer, and financing needs associated with ocean-based mitigation projects.
Create a working group providing guidance to Parties in developing regional risk and vulnerability assessments as called for by the GST and GGA by 2027.	This will help Parties identify and report the combined impacts of ocean warming, acidification, and deoxygenation caused by GHG and CO_2 emissions. The guidance should focus on best practices for evaluating threats to seafood species and marine ecosystems service. The guidance should include capacity building, technical transfer, and financing needs associated.

UNFCCC AND CONSTITUTED BODIES	WHY
The NAP Taskforce of the Adaptation Committee and Nairobi Work Programme Ocean Expert Group should identify example adaptation projects that support vulnerable seafood species, habitats, or seafood dependent communities.	This will help Parties identify and report the capacity building, technical transfer, and financing needs associated with related adaptation projects.
The Standing Committee on Finance should explore links between existing climate finance program funds and needs for ocean-based mitigation, adaptation, capacity building and technology transfer within NDCs and NAPs.	These links can help increase access for program funds that emphasize (1) food security; (2) nature-based solutions; (3) water quality (4) coral reef resilience; or (5) early warning and climate information systems.
Green Climate Fund (GCF), Global Environment Facility (GEF) and the Adaptation Fund (AF) should prioritize regional funding applications that advance monitoring, science and research capacity building and technology transfer related to understanding and responding to ocean acidification.	These funds can build upon regional partnerships already in place to measure ocean acidification in Latin America, the Pacific Islands and Africa. Regional programs to measure ocean acidification will help build a baseline, improve climate risk assessments and enhance adaptation strategies over time.

OTHER UN CONVENTIONS AND FRAMEWORKS	WHY
IOC-UNESCO and UN Sustainable Development Goal agenda should provide financing for Parties to implement UN Sustainable Development Goal (SDG) 14.3.1	This will help Parties conduct and report ocean acidification measurements under a common methodology, increasing regional baselines and capacity building.
FAO should accelerate research on the impacts of keystone seafood species and marine ecosystems under increased GHG and CO_2 emissions scenarios.	This will help improve climate-resilient fisheries and aquaculture strategies.
UN Decade of Ocean Science for Sustainability OA Research Programme should establish a framework to outline regional priorities in understanding and responding to ocean acidification with mitigation and adaptation measures.	This will help Parties identify and report the capacity building, technical transfer, and financing needs associated with related mitigation and adaptation projects.
The UN Convention on Biological Diversity should help parties identify the best way to assess impacts and responses related to Target 8, "Minimizing the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solution and/or ecosystem-based approaches.	This will help Parties in aligning actions to implement Target 8 of the 2023 biodiversity targets, including establishing baselines and conducting environmental impact assessments to determine potential threats to biological diversity caused by increased acidification.

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