



INTERNATIONAL ALLIANCE TO
COMBAT OCEAN ACIDIFICATION

ACTION PLAN TOOLKIT

WHY CREATE
A DOMESTIC
OR ACTION PLAN?

While increasing ambition to meet GHG and carbon mitigation goals and targets is essential for mitigating OA, there are additional actions governments can be incorporating now, across domestic strategies.

Advancing domestic OA action will inform better decision making for achieving national mitigation, adaptation, and resilience goals.

By joining the OA Alliance and endorsing the Call to Action, members commit to creating a unique OA Action Plan. An OA Action Plan encompasses the actions that OA Alliance members will take (or are taking) to better understand OA in their region and accelerate OA mitigation, adaptation, and resilience nearshore.

OA Action Plans help governments: take inventory; prioritize needs and make recommendations; and align policies and investments in the face of climate-ocean change.

This is especially important for achieving climate resilient fisheries and aquaculture, climate smart conservation, coastal resilience and habitat restoration, effective upgrades of infrastructure, and evaluation of marine carbon dioxide removal strategies.

OA Action Plans call forth renewed ambition to realize mitigation and adaptation targets in place across UNFCCC and deliver on Sustainable Development Goal 14.3, “to minimize and address ocean acidification.”



THE STRUCTURE OF AN
OA ACTION PLAN
IS ORGANIZED AROUND
6 KEY THEMES:



REDUCE ATMOSPHERIC EMISSIONS OF CO₂,
the number one cause of ocean acidification.



ADVANCE SCIENTIFIC UNDERSTANDING
of climate-ocean impacts, locally and globally.



REDUCE LOCAL POLLUTIONS THAT EXACERBATE OA
Implement actions that reduce local inputs of land-based pollutants (e.g., nutrient loading, storm water, and wastewater) that make conditions worse.



BUILD ADAPTATION AND RESILIENCE BUILDING STRATEGIES
Protect the environment and coastal communities from climate-ocean impacts through adaptation and resilience building strategies.



EXPAND PUBLIC AWARENESS
Engage policy makers, industry, scientists and the public on the growing threat posed by OA, as well as local actions that may be taken to address OA.



SUSTAIN INTERNATIONAL SUPPORT
Secure sustained support globally, regionally and locally for increased investments and actions.



ACTION #1

REDUCE ATMOSPHERIC EMISSIONS OF CO₂ THE NUMBER ONE CAUSE OF OCEAN ACIDIFICATION

The addition of CO₂ to the ocean from burning fossil fuels is making seawater more acidified; we call this process “ocean acidification” or OA. The chemical reactions that occur lower the pH of seawater and decrease the availability of carbonate, which many species like shellfish, finfish, and coral need to grow, reproduce, and thrive.

By mitigating and reducing CO₂ we are mitigating and reducing ocean acidification.

- Support policies, plans and commitments that seek to reduce anthropogenic carbon emissions and greenhouse gas emissions.
- Support policies that mandate 100% clean electricity, improve efficiency of buildings, and advance electrification of the transportation sector from cars to marine shipping.
- Support commitments and investments in renewable energy sources from solar to offshore wind.
- Identify and verify high impact blue carbon ecosystems to support carbon sequestration goals.
- Implement and advocate for initiatives creating climate smart communities (using greener power, waste reduction, and increased recycling, etc.).
- Engage leaders and policy makers to act as ambassadors to elevate urgency and ambition for climate action by highlighting impacts to ocean resources, ecosystems and communities.
- Integrate ocean into climate commitments, policies and multi-governmental frameworks.
- Work with international, national, regional and local partners to advocate for a comprehensive strategy to reduce anthropogenic carbon emissions and greenhouse gas emissions.



ACTION #2

ADVANCE SCIENTIFIC UNDERSTANDING OF CLIMATE-OCEAN IMPACTS, LOCALLY AND GLOBALLY

Globally, projections across IPCC reports tell us **that ocean acidification, warming and deoxygenation are going to increase at rates dependent on future emissions** of carbon dioxide and greenhouse gas emissions.

While we know this will cause impacts to marine life, we don't yet have complete regional or local information for: (a) the rates and scales this will occur in coastal areas, or (b) how key species are going to react to these changes.

Better understanding of local trends, drivers, biological and ecological impacts of OA will inform the best adaptation and resilience building actions.

The effectiveness of a local action depends upon unique factors and conditions.

- **Support better understanding of climate resilient fisheries management needs, aquaculture strategies, coral reef resilience and/or shellfish hatchery growing practices.**
- **Join, launch or expand nearshore and deep ocean monitoring networks that help determine where and at what rate regions are experiencing acidification and changing conditions.** Establish baseline monitoring necessary to capture natural variability in ocean carbon chemistry and understand long-term trends.
 - Ensure data compatibility in monitoring by adopting and adhering to the common indicators and methodology developed for UN Sustainable Development Goal 14.3.
 - Inventory regional monitoring and observing efforts and analyze for gaps to improve efficacy.
 - Support partnerships with local experts, fisheries, industry, traditional leaders, chiefs, universities and NGOs to participate in inclusive and sustained data collection. Develop and participate in a sustained national or regional citizen science programs that includes water sampling, pH monitoring and observations. This should include long term support for education, technical training and equipment.
 - Identify “hot spots” or areas that might be highly vulnerable to OA. Explore opportunities for monitoring, research and adaption.

- Identify existing protected areas, like Marine Protected Areas or Locally Managed Marine Areas, and explore opportunities for OA monitoring and research.
- Develop funding mechanisms to support research and monitoring. This will help ensure baseline data is available to better inform adaptation and policy decisions at a local level.

● **Conduct research to understand biological OA impacts. Assess vulnerability and risk to ecosystems and species locally.**

- Commission regional or national vulnerability assessments with an emphasis on social, economic and cultural vulnerability.
- Inventory existing case studies that examine ecological or biological species vulnerability thresholds and responses to OA. Identify additional studies that must be prioritized and commission reports.
- Support laboratory (ex situ) studies to assess the direct effects of OA, and other stressors, on local species and ecosystems.
- Support field (in situ) studies to characterize the effects of OA, alone or in combination with other stressors, on local species and ecosystems.
- Establish a regional or national clearing house for OA data, information and synthesis that can be accessed by governments and stakeholders with the goal of informing local decision making and actions.

● **Develop predictive and forecast models to inform responsive decision-making and management.**

- Invest and support the development models for short-term and long-term forecasting of corrosive conditions (predictive relationships for indicators of OA, such as pH and aragonite saturation state.)
- Invest and support the development of models to project ecological responses to OA and other climate stressors (e.g. how will coral reef or seagrass ecosystems respond to changing ocean conditions?) Undertake biological responses of key species (e.g. oysters, shrimp, lobster, fish) to predicted OA conditions and warming trends.

● **Assess the potential risks, benefits, monitoring, and evaluation needs of different marine carbon dioxide removal (mCDR) strategies.**



ACTION #3

REDUCE LOCAL POLLUTANTS THAT EXACERBATE OCEAN ACIDIFICATION

OA combines with other climate-ocean impacts like ocean warming and reduced oxygen levels, increasing the total stress marine species and ecosystems are experiencing.

In nearshore and coastal environments, local sources of land-based pollution like nitrates, wastewater, stormwater, and agriculture run-off additionally contribute to coastal acidification and eutrophication, **accelerating and amplifying the negative impacts.**

Actions to reduce these local land-based pollutants that contribute to coastal acidification and eutrophication can **reduce impacts on species and improve ecosystem function.**

- Apply local remediation strategies through the reduction of coastal pressures and land-based pollution.
- Improve water quality, identify OA “hot spots” and implement actions that reduce local pressures from coastal and terrestrial activities that contribute to coastal acidification and eutrophication.
- Support research and modeling to help characterize and determine the impact of local contributions to OA from land-based sources of pollution (e.g. nutrients, organic carbon, other) from sewage systems and wastewater.
- Implement strategies to limit the flow of nutrients and sediments from rivers and coastal catchments onto coral reefs, or into bays or estuaries. This could include vegetation-based remediation systems, for use in upland habitats and in vulnerable areas.

- Where pollution sources are identified, amend allowed land or water uses, update wastewater and storm water treatment requirements, and regulate land use actions to prevent and reduce run-off and water quality issues exacerbating coastal acidification.
- Ensure coastal development plans and land-use changes are managed in a way that considers local hydrology changes to water movement that could further exacerbate impacts of coastal acidification.
- Determine whether existing water quality criteria are adequate for tracking OA. Include OA as a potential point of concern and review in local water quality policies and permitting decisions.
- Eliminate destructive fishing activities, mining of coral rock, unregulated sand and gravel mining from streams and coasts and damage from boating and tourist operations.



ACTION #4

PROTECT THE ENVIRONMENT AND COASTAL COMMUNITIES FROM CLIMATE-OCEAN IMPACTS THROUGH ADAPTATION AND RESILIENCE BUILDING STRATEGIES.

In addition to reducing carbon emissions and local-land based pollutants, there are **many adaptation and resilience building actions** that governments and communities can take now by utilizing existing policy frameworks, resilience targets or management goals.

Local actions to improve resilience across marine ecosystems—**through blue carbon, nature-based solutions, planning or conservation measures**—can all have multiple beneficial outcomes for improving local conditions and increasing the adaptive capacity of marine species.

● Remediate or ameliorate the impacts of coastal acidification

- Conduct pilot projects to determine how submerged aquatic vegetation—like sea grass, kelp or mangroves—can absorb or sequester CO₂ in the water column and protect nearby calcifying organisms like coral reefs or shellfish.
- Build local capacity to preserve, protect, and restore submerged aquatic vegetation like mangroves, seagrass, kelp and saltmarsh.
- Identify and protect refuges for OA-vulnerable organisms.
- Manage resources and human activities to reduce co-occurring stressors that exacerbate ecosystem vulnerability. This could include precautionary fisheries policies and catch limits or establishing and enforcing Marine Protected Areas or Locally Managed Marine Areas.
- Guide the use of natural shorelines and coastal or marine habitat to support ecosystem resilience.

● Increase adaptation capacity and enhance species biological resilience

- Support techniques to adapt to OA impacts at shellfish hatcheries, such as buffering seawater, applying aeration strategies, or adding shell to marine waters.
- Maintain and enhance genetic diversity of native species including conservation hatchery techniques or selective breeding for tolerance and resilience.

- Develop hatchery and grow-out systems of freshwater pond aquaculture.
- Diversify catches of coastal demersal fisheries to match changes in species composition due to a) local increases in abundance due to changes in distribution; b) increase in herbivorous species.
- Pursue and support projects for coastal restoration in partnership with Tribal leaders, village chiefs, NGOs, local universities and other researchers.

● **Practice adaptive management to enhance community and economic resilience**

- Utilize marine management tools to protect and restore biodiversity and marine habitats.
- Improve sustainable ocean planning. Guide targeted regulations, seasonal closures, or conservation measures like Locally Managed Marine Areas (LMMAs), Marine Protected Areas (MPAs), and shared -use planning tools like Marine Spatial Planning (MSP).
- Develop methods to incorporate OA and ocean warming into existing short- and long-term resource management plans and adaptive management actions for species at varying scales.
- Support fisheries stock assessments designed to alert managers of climate related changing ocean conditions and resulting impacts. As applicable, transfer some fishing effort from coral reefs to oceanic species by installing fish aggregating devices close to the coast that will increase access for some communities.
- Develop alternative income options for fishing and other ocean resource dependent jobs and provide direct support for affected industries and communities. Establish funding sources and regional networks of financial aid for this purpose.



ACTION #5

EXPAND PUBLIC AWARENESS

OA Alliance members are **raising awareness about OA** and its impacts to marine life and resources that humans depend on.

It's important to help governments and non-governments **understand the actions or activities they can be taking now** to support OA mitigation, adaptation and resilience.

- **Increase visibility of OA as an issue and facilitate understanding of impacts and actions across government agencies and intergovernmental bodies**
 - Engage heads of state, governors, chiefs, ambassadors, ministers and mayors to act as ambassadors on ocean acidification and put them on panels, commissions and other platforms to help elevate the issue.
 - Appoint positions within appropriate departments/ agencies/ ministries to focus on ocean acidification and ocean changes from a resource management and climate mitigation, adaptation and resilience perspective.
 - Help policy makers and resource managers understand how they might integrate OA science and current findings into mitigation and resilience planning.
 - Communicate OA issues and science developments to regulators. Support regulatory bodies in publicizing and communicating local ocean acidification impacts and potential responses.
- **Engage local academia, public, industry, stakeholders, villages and communities**
 - Leverage relationships with local academic institutions, Tribal governments, traditional leaders, chiefs, city leaders, and NGOs within the region to provide a platform and inclusive approach to learning more about the impacts of ocean acidification on local water bodies, including through shared data collection. This could be accomplished through panels, task forces, committees, and workshops to increase understanding and awareness.

- Attend conferences, symposiums, workshops, and other events that include diverse audiences and impacted communities and share knowledge about OA impacts and responses.
- Share information with OA vulnerable industries and professions by convening specialists and/or industry representatives. Engage the seafood industry, aquaria, NGOs and other private sector partners around ways to connect with their membership about what is at risk.

● **Educate and facilitate understanding on the drivers and impacts of ocean acidification**

- Leverage existing education and outreach networks to inform stakeholders and the public about OA.
- Create public education curriculum to teach youth about climate change impacts felt in our oceans. Help educators develop and implement curricula on OA and associated climate issues for primary, secondary and higher education. Aid formal and informal OA education programs and teacher trainings.
- Facilitate community and village conversations and include facts and summaries of the issue. Share information with potentially vulnerable fisheries and industries through convening specialists and scientists within the region.



ACTION #6

SUSTAIN INTERNATIONAL SUPPORT

International and multi-government commitments to addressing climate change and sustainable development play an important role in stimulating collective action on OA.

Less than 2% of international climate adaptation funding is applied towards ocean and coastal adaptation projects. Only 1.6% of official development assistance supports the ocean economy. SDG 14 is the least funded of the UN Sustainable Development Goals. Internationally, approximately 70% of the knowledge generated about ocean acidification comes from research conducted across North American and European countries.

This means that **UN and domestic frameworks must be leveraged to ensure adequate focus and equitable investments** in climate-ocean change information, gaps analysis, and capacity or technology transfer that result in better preparedness, mitigation, and adaptation choices for all.

- Join and participate in the International Alliance to Combat Ocean Acidification (OA Alliance.)
- Join and actively engage with international knowledge-exchange networks focused on OA, including Global Ocean Acidification Observing Network (GOA-ON), the International Ocean Acidification Coordinating Centre (OA-ICC), Ocean Acidification international Reference User Group (OAiRUG), or the UN's IOC Sub-Commission for the Western Pacific (WESTPAC). the OA Information Exchange (OAIE.)
- Call for emissions reductions and ocean adaptation actions under international climate frameworks like the United Nations Framework Convention on Climate Change (UNFCCC.)
- Register voluntary commitments relevant to climate-ocean impacts to the UN Sustainable Development Goal Platform (SDG 13 and 14.)
- Include OA and other climate-ocean action plans within Nationally Determined Contributions and Convention on Biological Diversity Aichi Targets.

- Integrate OA into National Ocean Policies, National Action Plans and Joint National Action Plans by incorporating the most current science, vulnerability assessments and actions that support mitigation, adaptation and resilience planning.
- Include climate-ocean adaptation strategies, policies, and priorities across adaptation communications.
- Contribute ideas and plans to the Platform for Science-Based Ocean Solutions, created by the COP25 Presidency to bring together best practices, methodologies and tools to help national governments incorporate oceans into Nationally Determined Contributions.
- Enhance collaboration and coordination of OA efforts across a region and with other governments and organizations focused on ocean, climate and coastal issues. Ensure that OA is a permanent agenda item at regional meetings.
- Convene stakeholders, decision makers and other target audiences to promote understanding of OA causes and consequences at regional and international symposiums, conferences, workshops and other events.
- Leverage funding opportunities through framework conventions like CBD, UNFCCC and through programs such as UNEP to assist with implementation of measures related to science, monitoring, mitigation, adaptation and resilience building as relevant to OA impacts.



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