

OCEAN ACIDIFICATION IN THE WESTERN INDIAN OCEAN REGION

Workshops for Implementation of the Nairobi Convention
2025 – 2028 Work Programme and COP II Decisions

27 – 31 January 2025, Dar es Salaam Tanzania



Layout

- Overview
- Situational Analysis
- WIO Action Plan

Ocean Acidification and Its Impact on the Western Indian Ocean (WIO) Region



SUMMARY

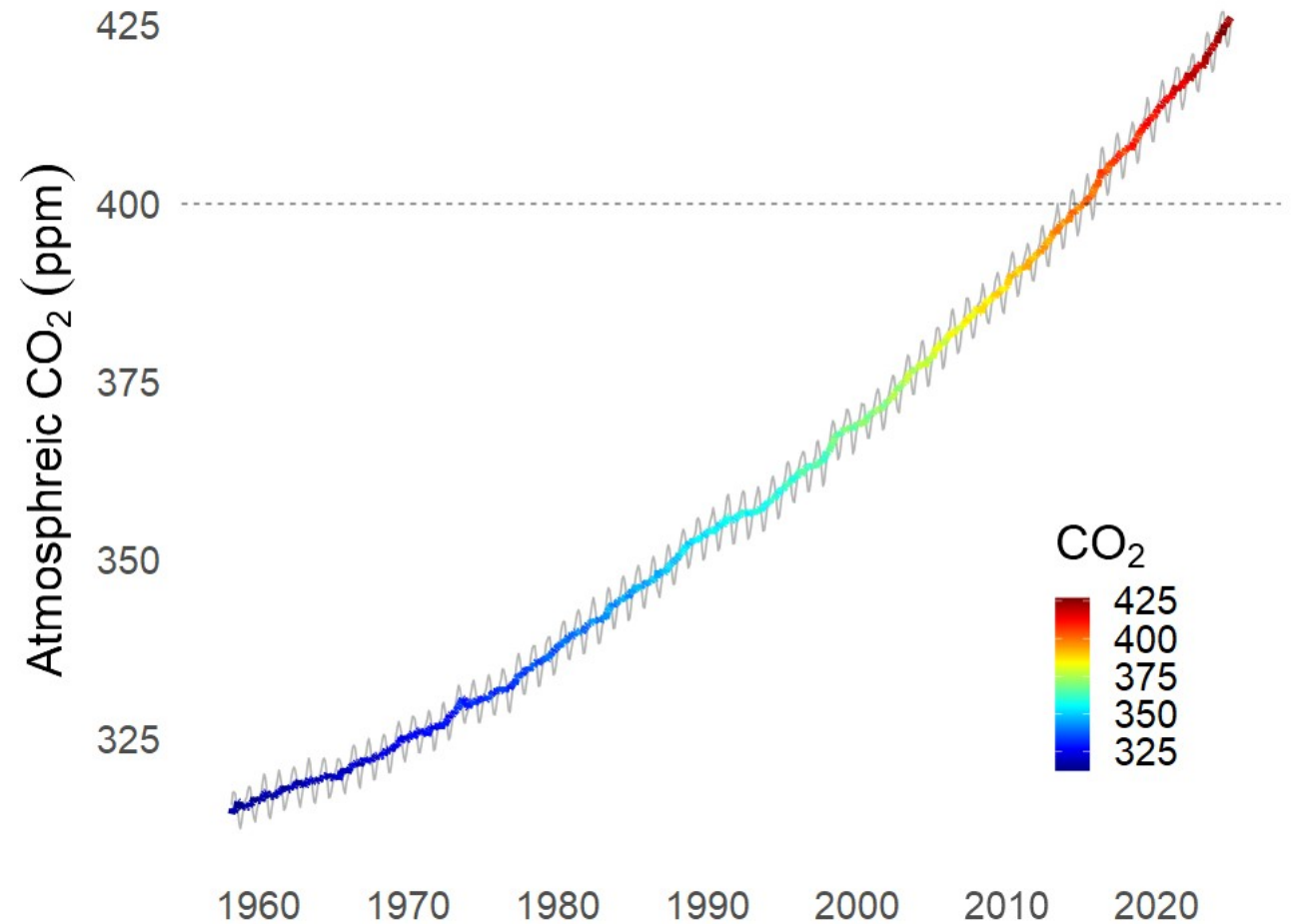
Urgent action is needed to address Ocean Acidification (OA) and its impacts in the Western Indian Ocean (WIO) region – a marine biodiversity hotspot where coastal communities depend on these resources for livelihoods and food security. Since the Industrial Revolution, the oceans have absorbed 30% of human-caused carbon dioxide (CO₂) emissions, increasing acidity and posing a significant threat to marine life, ecosystems, and the vital services they provide. This policy brief highlights the current status and impacts of ocean acidification in the WIO region. It outlines adaptation and mitigation strategies outlined in the WIO OA Action Plan, which is set for implementation from 2025 to address this pressing issue.

INTRODUCTION

Background

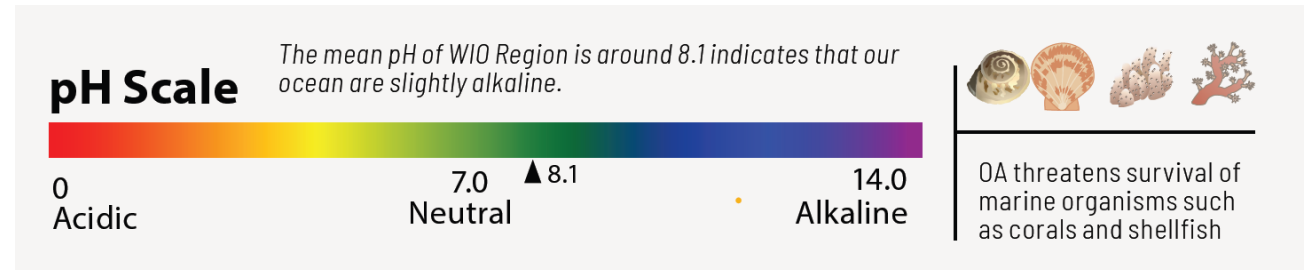
Ocean Acidification refers to the gradual decrease in the pH of the Earth's oceans due to the uptake of carbon dioxide (CO_2) from the atmosphere.

- The oceans absorb about 30% of deforestation, cement production.
- In seawater, CO_2 reacts with water (H_2O) to form carbonic acid (H_2CO_3).



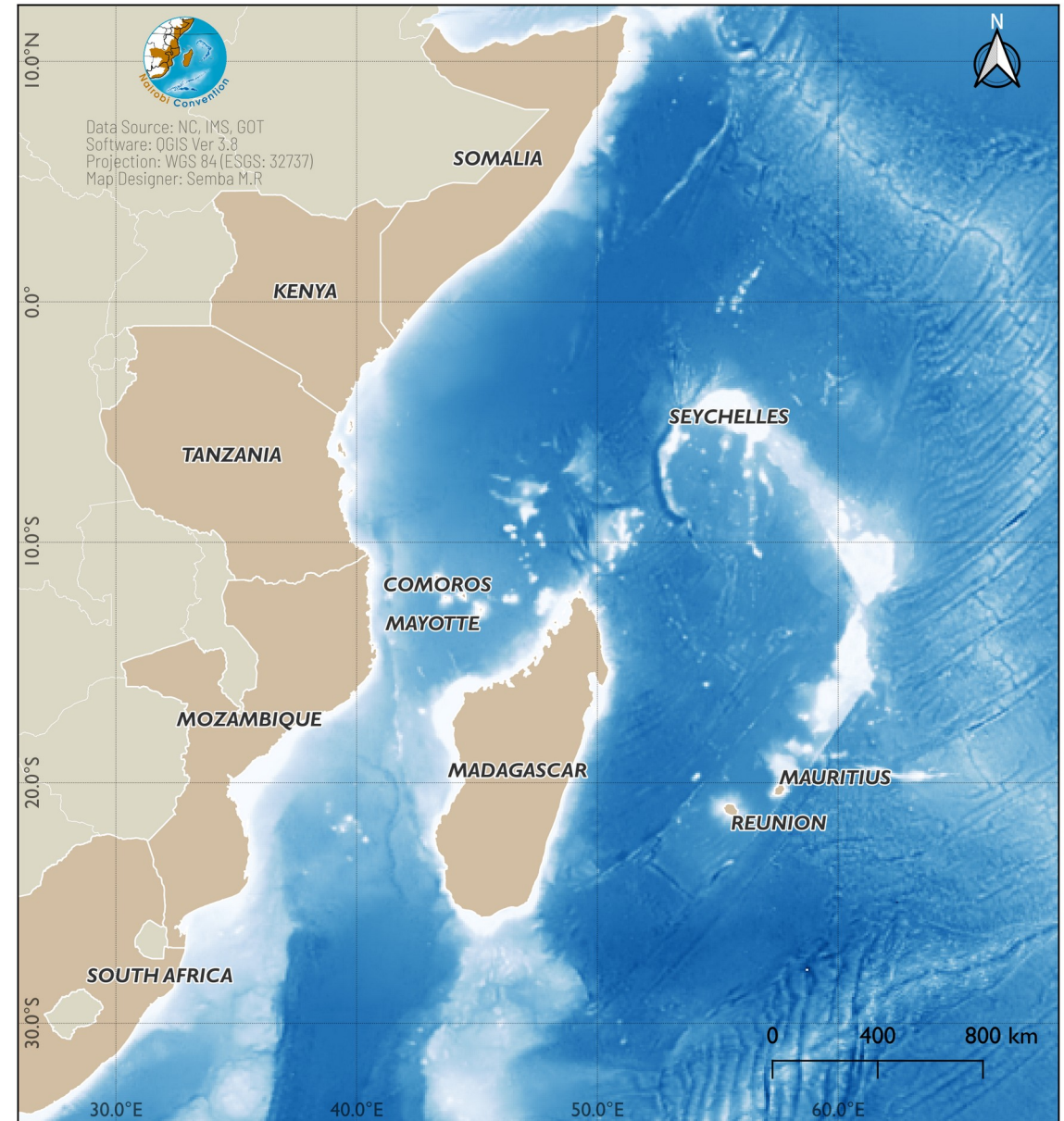
Background

- The average pH is approximately 8.1 today
- A decrease of about 0.1 pH units from industrial time,
- This correspond to a 26% increase in acidity.



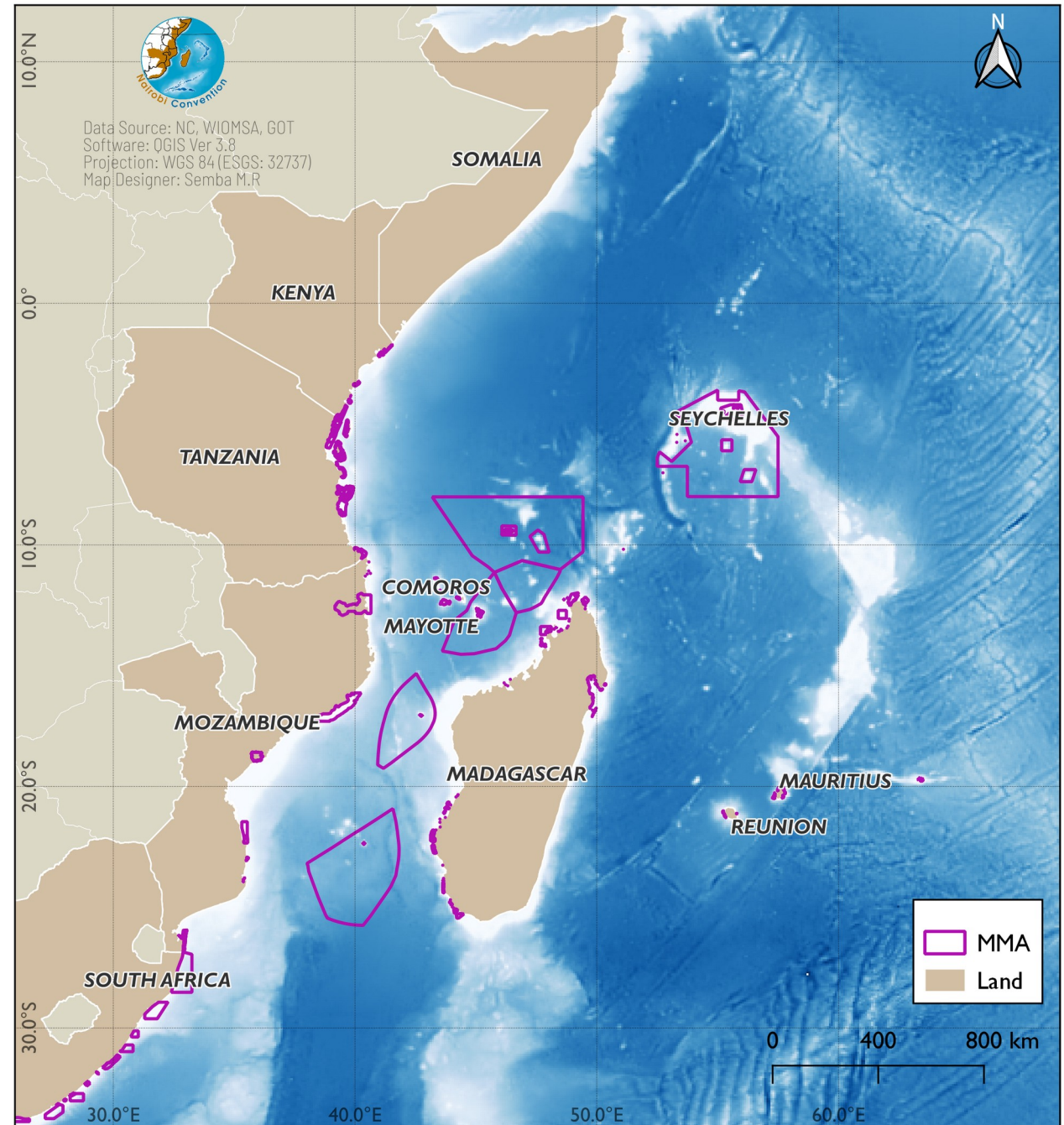
Scope

- The WIO region, comprising of 10 countries
- Somalia, Kenya, Tanzania, Mozambique, South Africa, Madagascar, Comoros, Reunion, Mauritius and Seychelles.



Rationale

- The WIO region is rich in marine biodiversity
- Over 50 MPAs established, covering coral reefs, mangroves, and seagrasses
- Provides livelihoods for 60 millions of people



Rationale

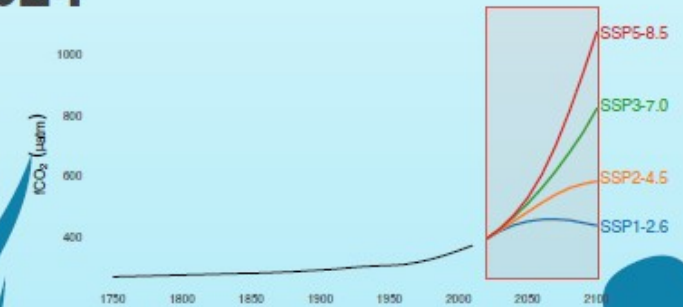
- OA in the WIO region is increasing.
- Threats to marine ecosystems and associated livelihoods.
- Efforts to address OA is fragmented and uncoordinated.
- Unclear framework prevents toward effective solutions.



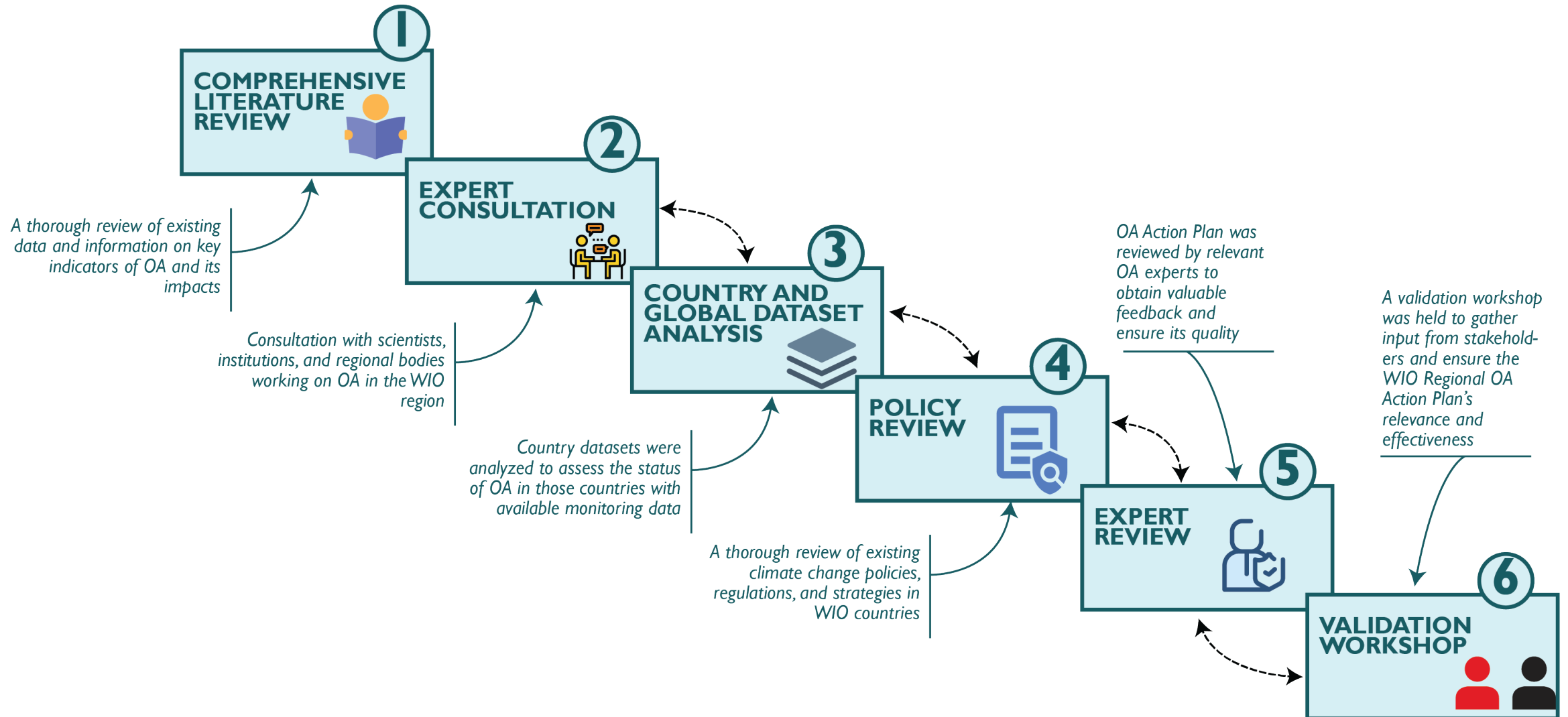
A Review on

OCEAN ACIDIFICATION AND IT'S POTENTIAL IMPACTS ON MARINE ENVIRONMENT AND FOOD SECURITY IN THE WESTERN INDIAN OCEAN REGION

2024



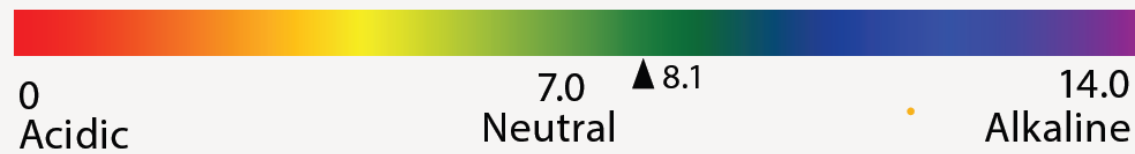
Regional Action Plan Formulation Process



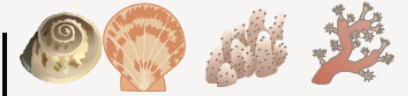
SITUATIONAL ANALYSIS

Causes of OA

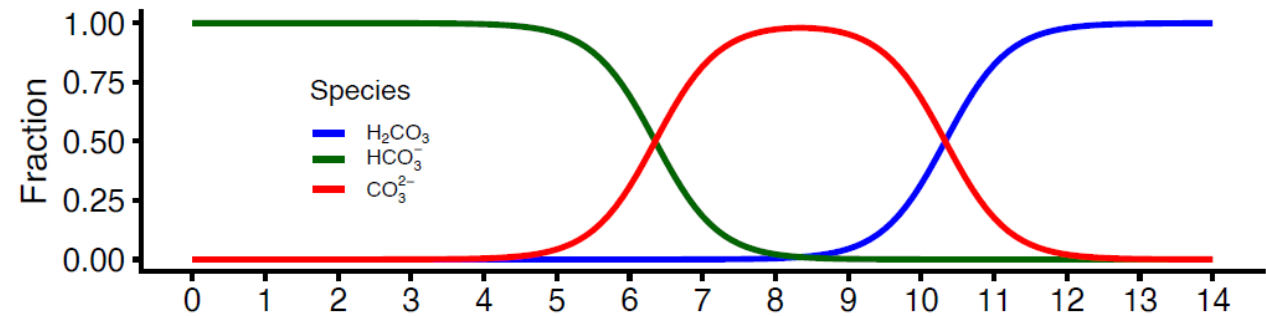
pH Scale



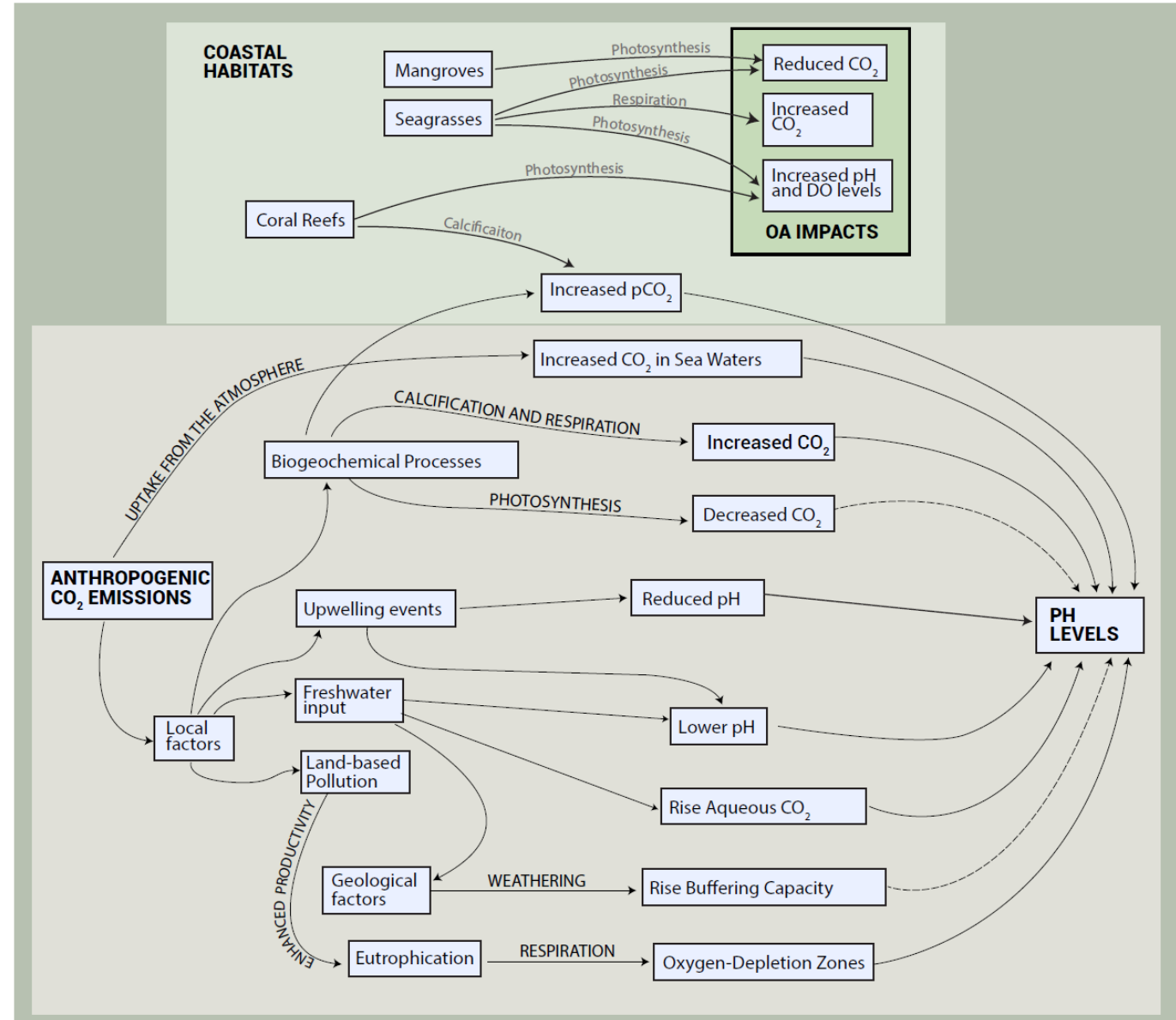
The mean pH of WIO Region is around 8.1 indicates that our ocean are slightly alkaline.



OA threatens survival of marine organisms such as corals and shellfish

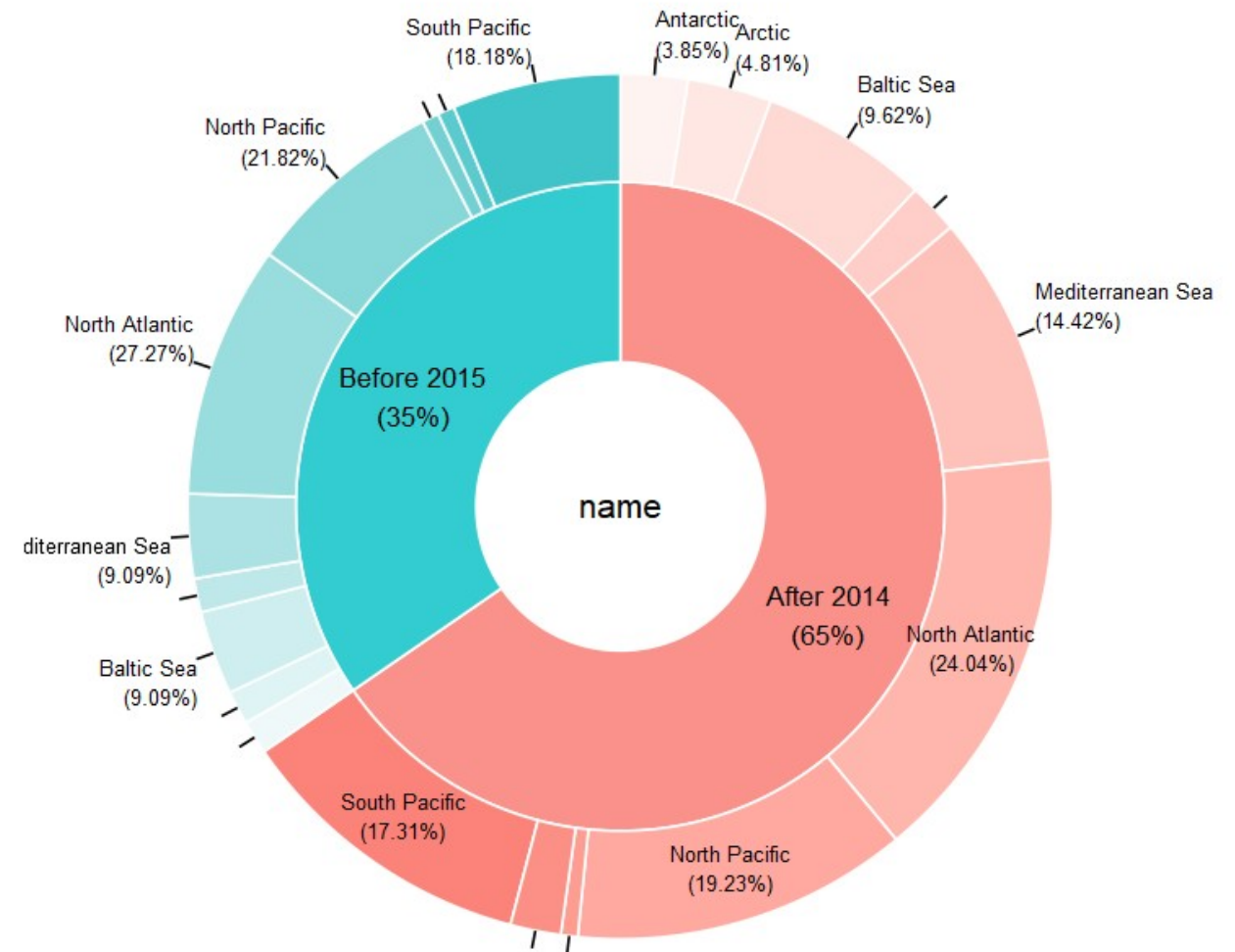


Drivers of OA

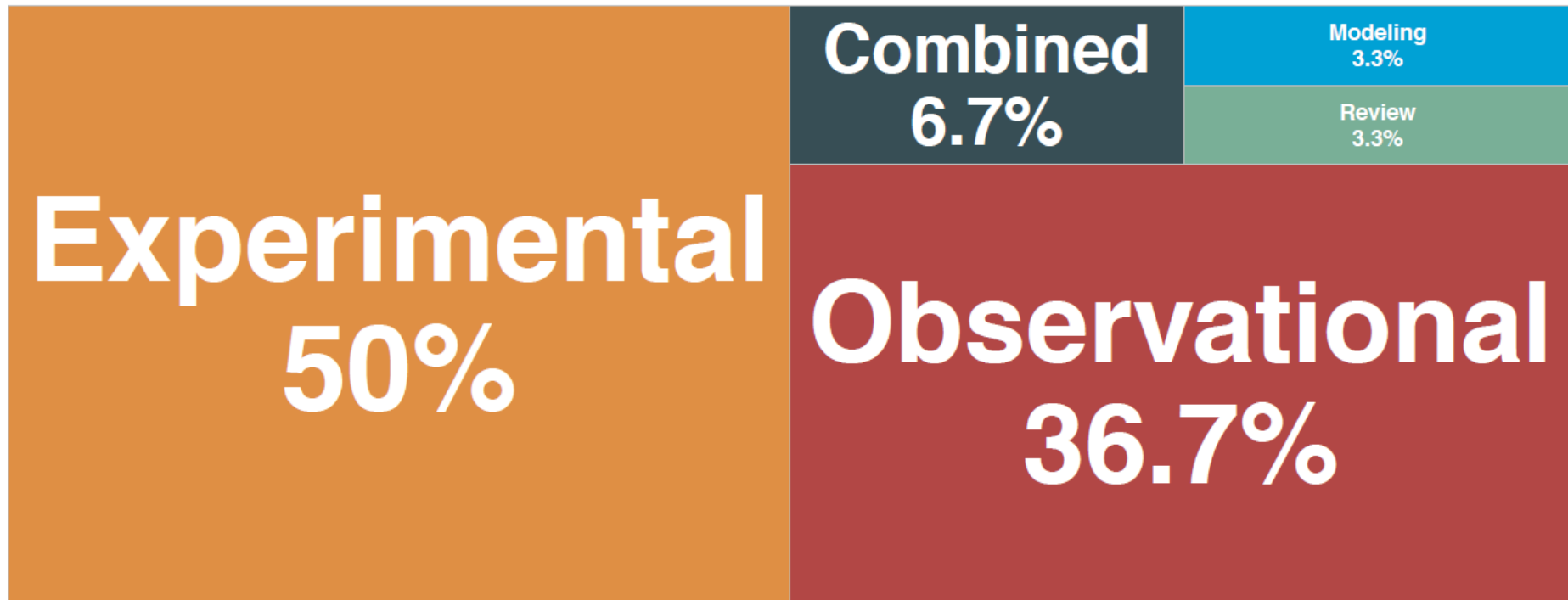


State of OA Knowledge in the WIO

- Only 35% of publications before 2015
- More than 65% of OA publication after 2025



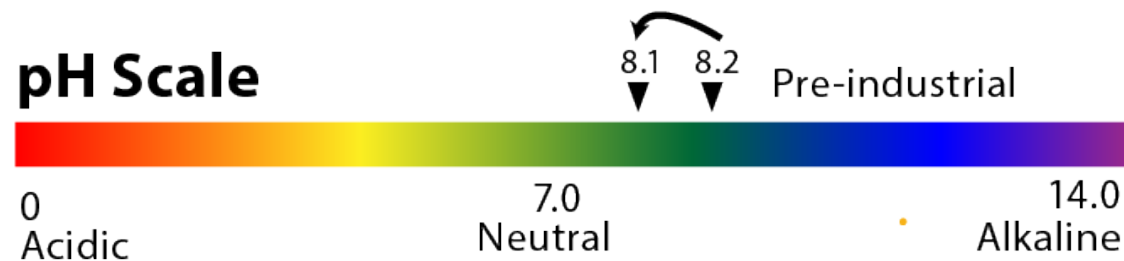
State of OA Knowledge in the WIO



STATE AND TRENDS

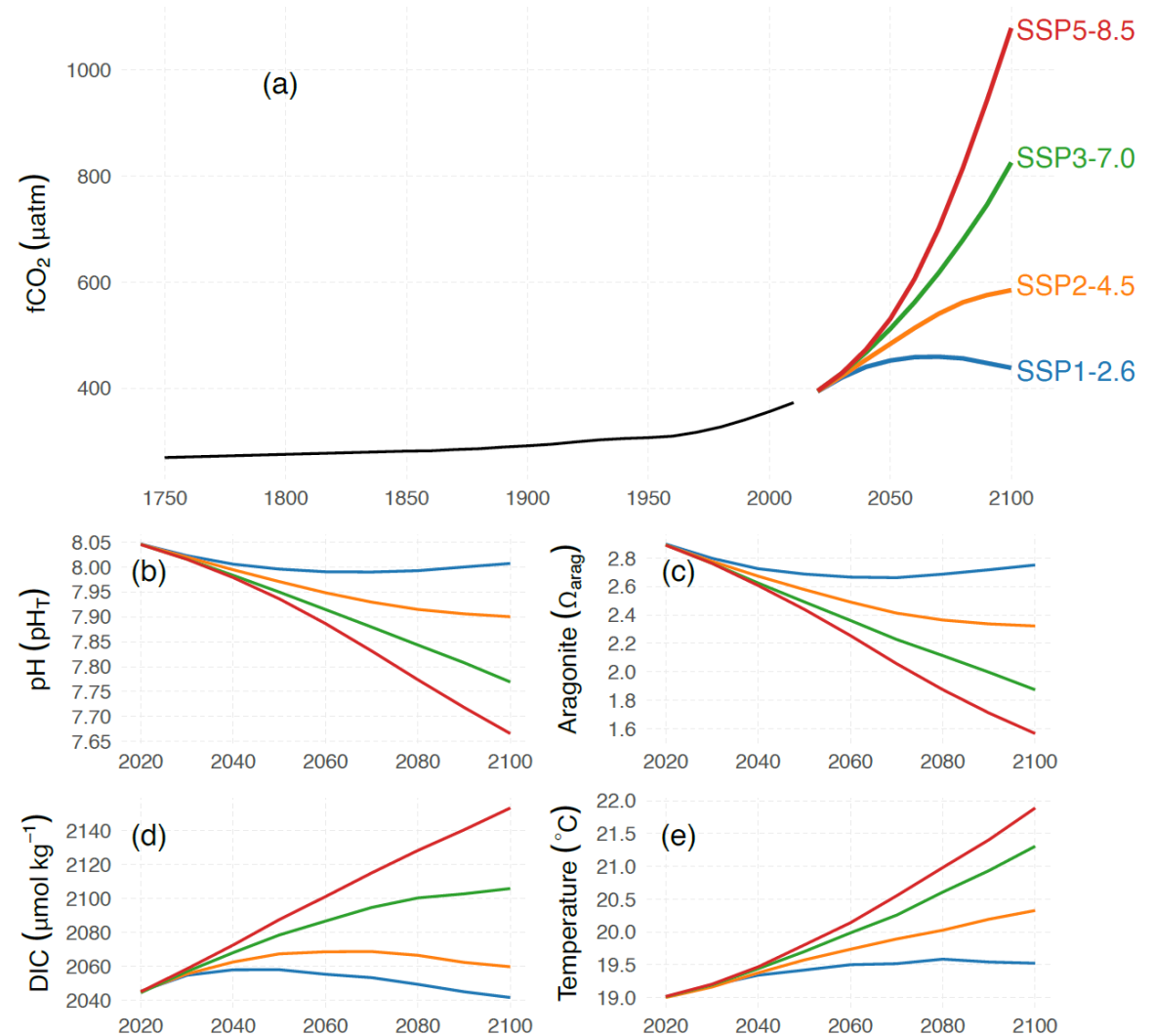
Status of OA

- The mean pH of the WIO region is approximately 8.1.
- This indicates that ocean pH has decreased by 0.1.
- The pre-industrial pH value was approximately 8.2.



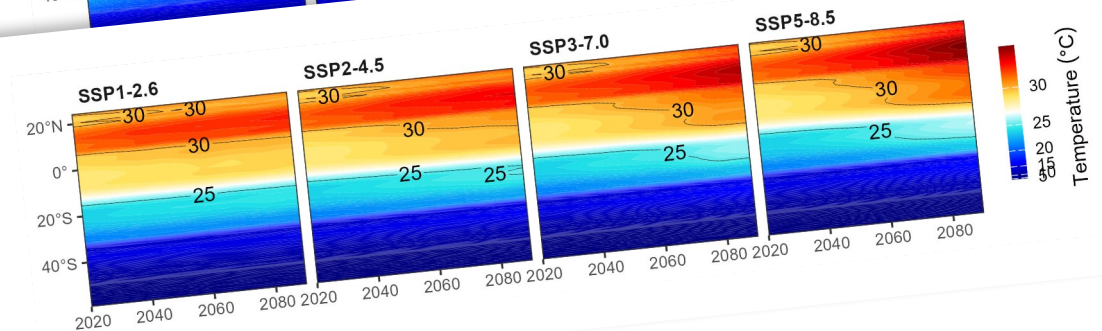
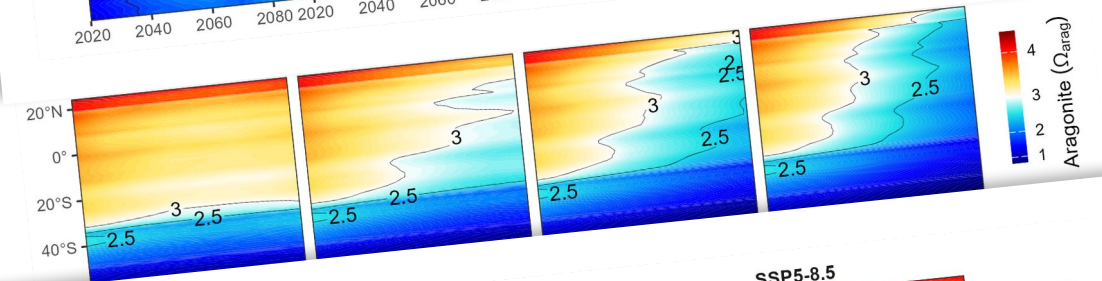
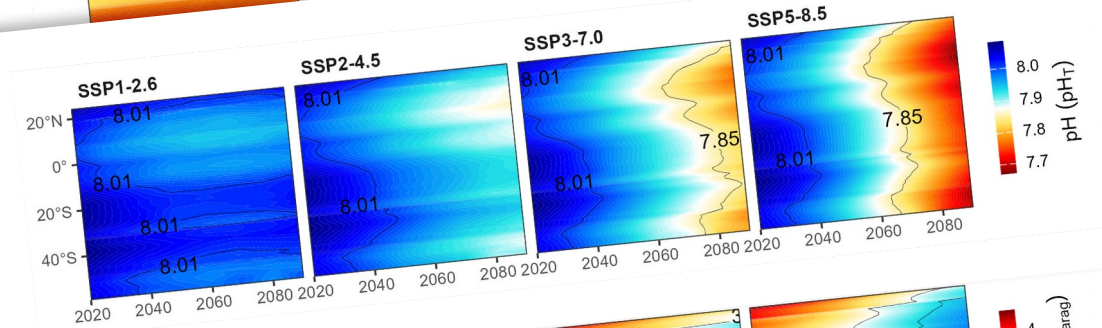
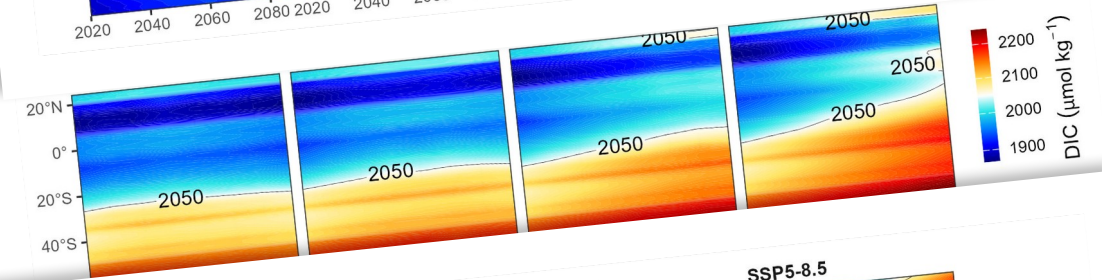
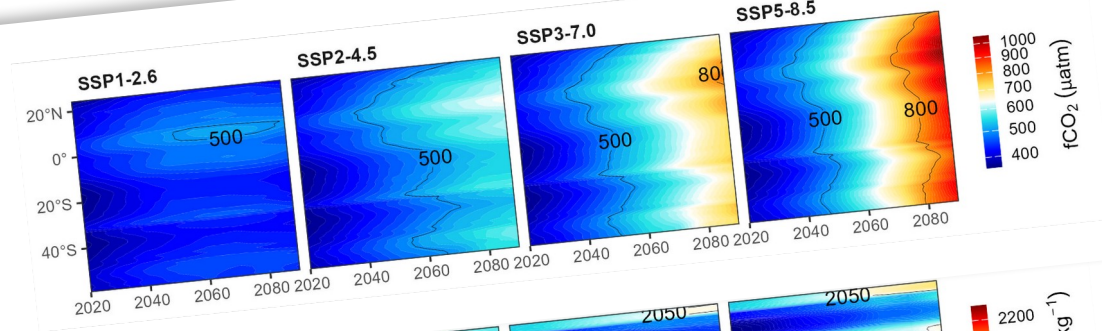
Trends of OA

- Ocean pH has been steadily declining over the past two centuries
- Projected pH to drop to around 7.7–7.8, depending on emission scenarios.
- Coastal zones and upwelling areas may experience more severe acidification.



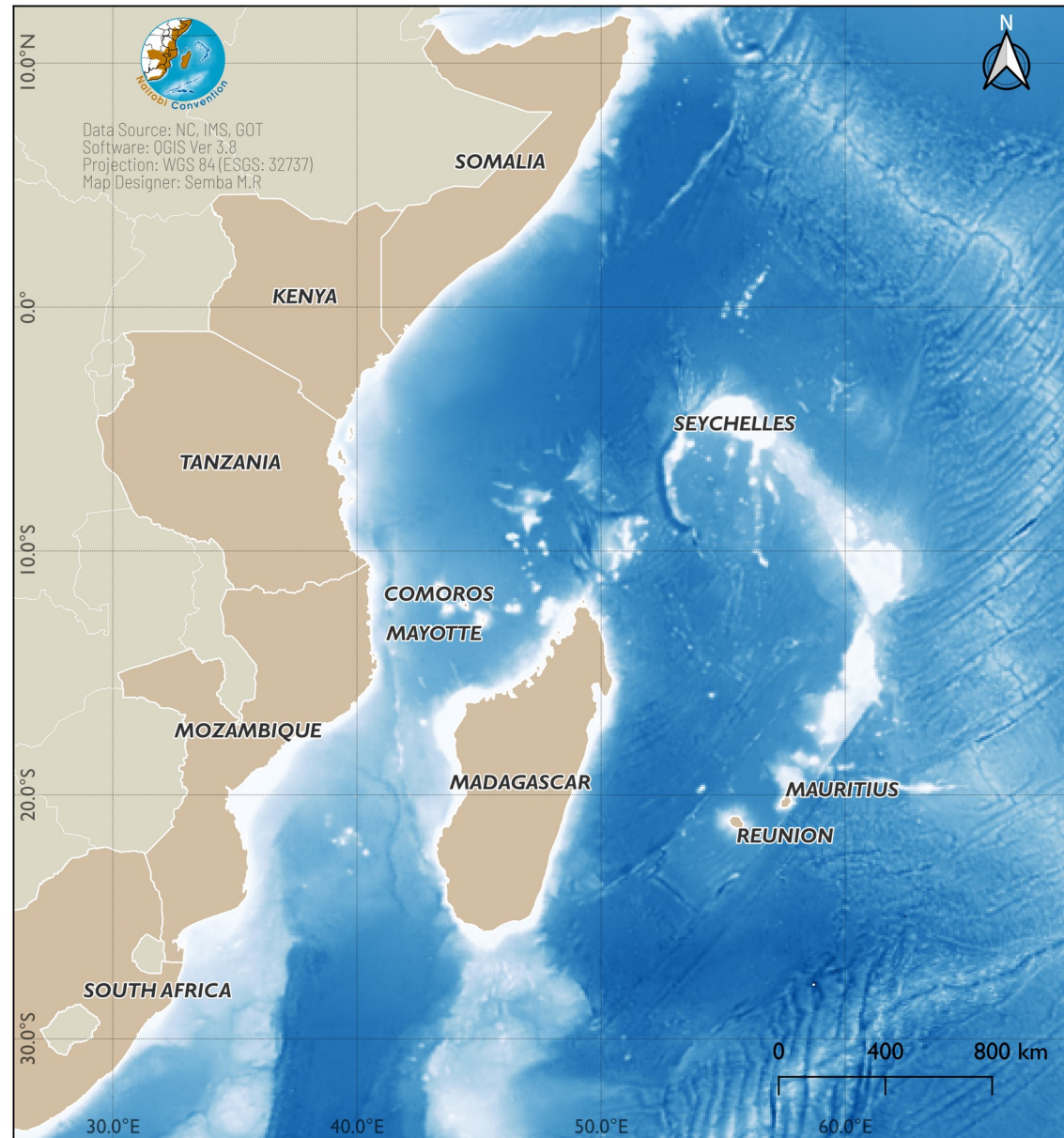
Trends of OA

Temporal and space



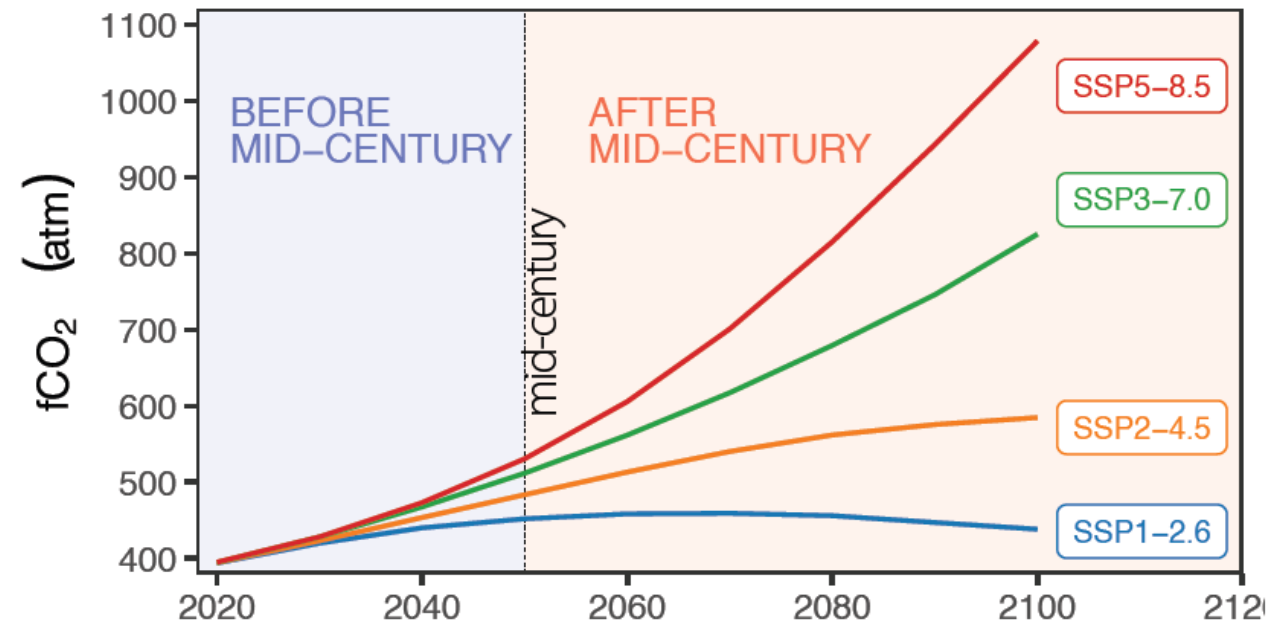
Policy Integration

The region lack a robust integration of OA mitigation and adaptation measures into their existing climate change policies, regulations and strategies.



Optimal Pathway to Mitigate OA and Minimize its Impacts

Optimistic (SSP1-2.6) scenario is the most effective Socio-Economic Pathway for mitigating OA and minimizing its impacts in the WIO region.

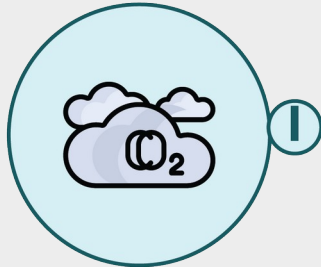


Barriers

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Barriers that could hinder WIO countries from addressing OA are identified based on knowledge gaps, current state, trends and impacts of OA on marine organisms, ecosystems and food security in the WIO region.

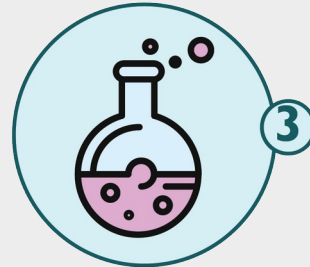
Increasing carbon emissions



Increasing coastal pollution



Inadequate OA Research and Capacity



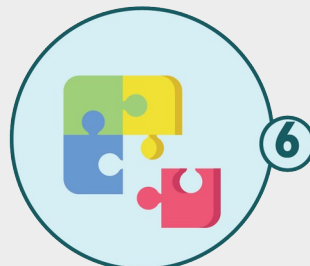
Limited Research on OA Impacts



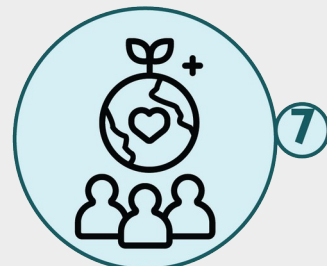
Lack of a Clear Framework



Insufficient Integration



Low Public Awareness



THE WIO OA ACTION PLAN

Vison, Mission and Goal

VISION

“ Our vision is safeguard the WIO, ensuring that organisms and ecosystems thrive and continue to deliver essential services for human well-being in the region. ”

MISSION

“ Our mission is to empower countries in the WIO region to mitigate OA and minimize its impacts. ”

GOAL

“ Our goal is to mitigate OA and minimize its impacts on marine organisms, ecosystems, livelihood and food security in the WIO region by 2035. ”



Strategic Priorities for the Action Plan

1. Mitigating OA/Climate protection measures
2. Advancing understanding of OA and its impacts
3. Reducing local water-borne and airborne pollution
4. Building resilience and adaptation for affected communities
5. Mainstreaming resilience and adaptation measures into policies
6. Enhancing collaboration and partnerships

Strategic Priorities for the Action Plan

Strategy	Actions	KPI	Timeframe
1.Mitigating OA/Climate protection measures	1.1.Promote transitioning to renewable energy sources (solar, gas, wind, geothermal, tidal)	1.1.1.Percentage of energy sourced from renewables	1.1.1.Medium
	1.2.Promote utilisation of gas-fueled vehicles	1.2.2.Number of gas-fueled vehicles in operation	1.2.2.Short
	1.3.Reduce deforestation and promote reforestation	1.3.3.Area of forest restored or conserved	1.3.3.Ongoing
	1.4.Promote conservation and restoration of blue carbon habitats	1.4.4.Extent of blue carbon habitat restored	1.4.4.Ongoing
	1.5.Effectively implement international agreements like the Paris Agreement	1.5.5.Level of adherence to international agreements	1.5.5.Ongoing
	1.6.Implement national and regional policies to reduce emissions	1.6.6.Policies in place to reduce carbon emissions	1.6.6.Ongoing

Strategic Priorities for the Action Plan

2. Advancing understanding of OA and its impacts	2.1. Conduct continuous monitoring of OA indicators using advanced technologies	2.1.1. Number of monitoring stations deployed	2.1.1. Ongoing
	2.2. Conduct experimental studies to assess OA impacts	2.2.2. Number of studies on OA impacts published	2.2.2. Medium
	2.3. Conduct OA vulnerability assessments on coastal communities	2.3.3. OA vulnerability assessment reports	2.3.3. Short
	2.4. Conduct modelling studies to forecast OA trends	2.4.4. Forecasting models on OA trends	2.4.4. Medium
	2.5. Build capacity for OA expertise in WIO region	2.5.5. Number of trained scientists and policymakers	2.5.5. Ongoing
	2.6. Build infrastructure capacity for OA research	2.6.6. Upgraded facilities and resources for OA research	2.6.6. Ongoing
	2.7. Build capacity for OA monitoring and data analysis	2.7.7. Capacity development for OA data analysis	2.7.7. Medium
	2.8. Establish community-based monitoring programs to track OA	2.8.8. Community participation in monitoring programs	2.8.8. Medium

Strategic Priorities for the Action Plan

Strategy	Actions	KPI	Timeframe
3.Reducing local water-borne and airborne pollution	3.1.Upgrade/install new wastewater treatment infrastructure	3.1.1.Number of wastewater systems upgraded	3.1.1.Long
	3.2.Implement policies to reduce plastic production and consumption	3.2.2.Plastic waste reduction metrics	3.2.2.Medium
	3.3.Strengthen waste management systems	3.3.3.Improvement in waste collection coverage	3.3.3.Short to Medium
	3.4.Promote sustainable farming through organic fertilizers	3.4.4.Percentage decrease in chemical fertilizer use	3.4.4.Medium
	3.5.Monitor and regulate industrial waste	3.5.5.Number of industries compliant with waste treatment standards	3.5.5.Ongoing
	3.6.Run public campaigns on pollution impacts and promote sustainable practices	3.6.6.Number of campaigns conducted	3.6.6.Short
	3.7.Protect and restore mangroves and salt marshes	3.7.7.Area of habitats restored	3.7.7.Medium to Long
	3.8.Develop monitoring and reporting systems for industrial emissions	3.8.8.Number of emission reports submitted	3.8.8.Medium
	3.9.Monitor pollution levels in coastal waters	3.9.9.Regularity of pollution monitoring reports	3.9.9.Ongoing
	3.10.Set discharge limits in pollution discharge permits	3.10.10.Number of permits issued with new discharge limits	3.10.10.Short

Strategic Priorities for the Action Plan

Strategy	Actions	KPI	Timeframe
4. Building resilience and adaptation for affected communities	4.1. Promote mariculture of resilient marine species	4.1.1. Number of mariculture projects established	4.1.1. Short to Medium
	4.2. Raise awareness of OA through education and outreach programs	4.2.2. Number of outreach programs conducted	4.2.2. Short to Medium
	4.3. Promote protection and restoration of seagrass meadows	4.3.3. Area of seagrass meadows restored	4.3.3. Medium to Long
	4.4. Promote adoption of IMTAs incorporating seagrass or seaweeds	4.4.4. Number of IMTAs implemented	4.4.4. Medium
	4.5. Develop financial assistance programs for shellfish farmers	4.5.5. Number of financial programs developed	4.5.5. Short
	4.6. Promote diversification of livelihoods in coastal communities	4.6.6. Increase in non-fishing income sources	4.6.6. Short to Medium
	4.7. Enhance fisheries and aquaculture value chains	4.7.7. Percentage increase in value of fisheries products	4.7.7. Medium
	4.8. Develop micro-credit and loan schemes	4.8.8. Number of schemes implemented	4.8.8. Medium
	4.9. Integrate OA into local development plans	4.9.9. Number of plans integrating OA	4.9.9. Medium
	4.10. Remove excess CO ₂ from the water before it enters the mariculture hatchery	4.10.10. Number of hatcheries	4.10.10. NA
	4.11. Adjust total alkalinity of seawater before enters mariculture hatchery	4.11.11. Number of hatcheries	4.11.11. NA

Strategic Priorities for the Action Plan

5. Mainstreaming resilience and adaptation measures into policies	5.1. Revise national/regional policies to include OA mitigation	5.1.1. Number of revised policies	5.1.1. Medium
	5.2. Integrate coastal pollution into EIAs for development projects	5.2.2. Number of EIAs incorporating coastal pollution	5.2.2. Ongoing
	5.3. Raise awareness among policymakers through training and workshops	5.3.3. Number of workshops held	5.3.3. Short
	5.4. Enhance access to OA data platforms	5.4.4. Number of active users on OA data platforms	5.4.4. Short to Medium
	5.5. Incorporate OA monitoring into Marine Protected Areas (MPAs) management	5.5.5. Number of MPAs with OA monitoring	5.5.5. Medium
	5.6. Create a multi-stakeholder engagement forum	5.6.6. Number of forums organized	5.6.6. Short
	5.7. Organize annual workshops and meetings on OA resilience	5.7.7. Number of workshops conducted	5.7.7. Ongoing

Strategic Priorities for the Action Plan

Strategy	Actions	KPI	Timeframe
6.Enhancing collaboration and partnerships	6.1.Support and expand the OA Working Group	6.1.1.Number of working group members	6.1.1.Ongoing
	6.2.Standardize data collection protocols	6.2.2.Number of standardized data protocols established	6.2.2.Short to Medium
	6.3.Organize regional workshops and conferences on OA	6.3.3.Number of regional workshops organized	6.3.3.Ongoing
	6.4.Develop a regional OA data repository	6.4.4.Accessibility of data repository	6.4.4.Medium
	6.5.Promote collaboration between WIO researchers and global counterparts	6.5.5.Number of collaboration projects	6.5.5.Ongoing
	6.6.Develop and implement data sharing mechanisms	6.6.6.Number of data sharing agreements	6.6.6.Medium

Thank You