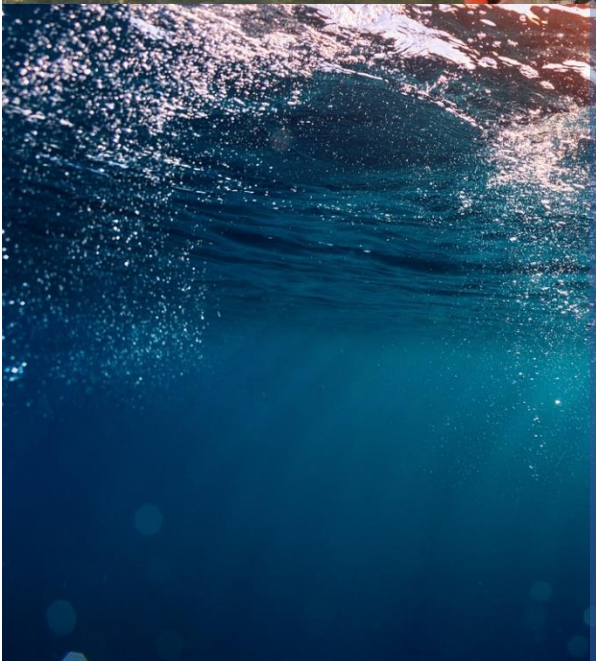




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SAPPHIRE PROJECT



July 2021

Accelerating climate change impacts on Kenya's marine ecosystems – what to be prepared for?



Accelerating climate change impacts on Kenya's marine ecosystems – what to be prepared for?

Key Messages:

Kenya's marine environment is entering a period of rapid change and uncertainty brought about by anthropogenic climate change.

There will be considerable socio-economic implications for coastal populations due to the accelerating negative impacts of climate change on marine ecosystems

Climate change impacts on marine ecosystems should be integrated into the country's strategic plans for marine food security, blue economy and fishery policies

Greater investment in local marine research capacity will enable access, analysis and interpretation of available climate-related information and improve use of future climate projections in national policies

Climate change will impact Kenyan marine ecosystems and fisheries via multiple direct and indirect pathways. The wide range of habitats, behaviours and life history strategies of commercially exploited species means that their response to climate change will vary greatly between species and between geographical areas.

How urgent is the problem?

The impact of anthropogenic climate change on Kenyan marine waters is no longer a possibility for the distant future. Marine ecosystems are feeling the impacts now. Coral reefs – the most diverse of marine ecosystems - are already experiencing mass bleaching events that are becoming both more intense and more frequent. **Marine heatwaves** are amongst the earliest signs of anthropogenic climate change. They too are becoming more frequent and more intense. Recent scientific research shows that ***the first year-long marine heatwave may occur in Kenyan EEZ waters as early as the 2030s.***

What are the key recent scientific advances and gaps in understanding the climate change impacts on marine ecosystems of Kenya?

Our confidence in future projections of climate change impacts on the marine environment of the Western Indian Ocean is increasing. Recent international and global research partnerships have vastly improved the observational and modelling basis for future climate change scenarios generating a considerable amount of open access information. An urgent investment into local research capacity to access, analyse and interpret climate change related information is now required to improve its effective use in policy.

However, a **key challenge lies in filling the gaps in analyses of climate impacts and their consequences for communities and economic sectors.** Projections of such system-level responses, which take into consideration specifics of the Kenyan region, should be at the core of climate change adaptation decision making.

Can we predict how the North Kenya Banks Upwelling will respond to climate change?

The North Kenya Banks shelf break upwelling is a very productive, but highly variable and short-lived oceanographic feature that brings deep waters rich in nutrients to the ocean surface. The presence of cooler ocean temperatures and higher nutrient concentrations induced by upwelling may provide delayed onset of some climate change impacts in the area affected by this upwelling relative to the rest of Kenyan shelf waters. At the same time deep ocean upwelling may lead to earlier onset of ocean acidification and deoxygenation. How this regionally important upwelling will evolve over the course of the next few decades under the accelerating impact of global warming is still **outside predictive modelling capabilities**. This is one of the key factors that needs to be understood to ensure that fisheries policies developed for the North Kenya Banks and wider Kenyan EEZ are climate-proof.

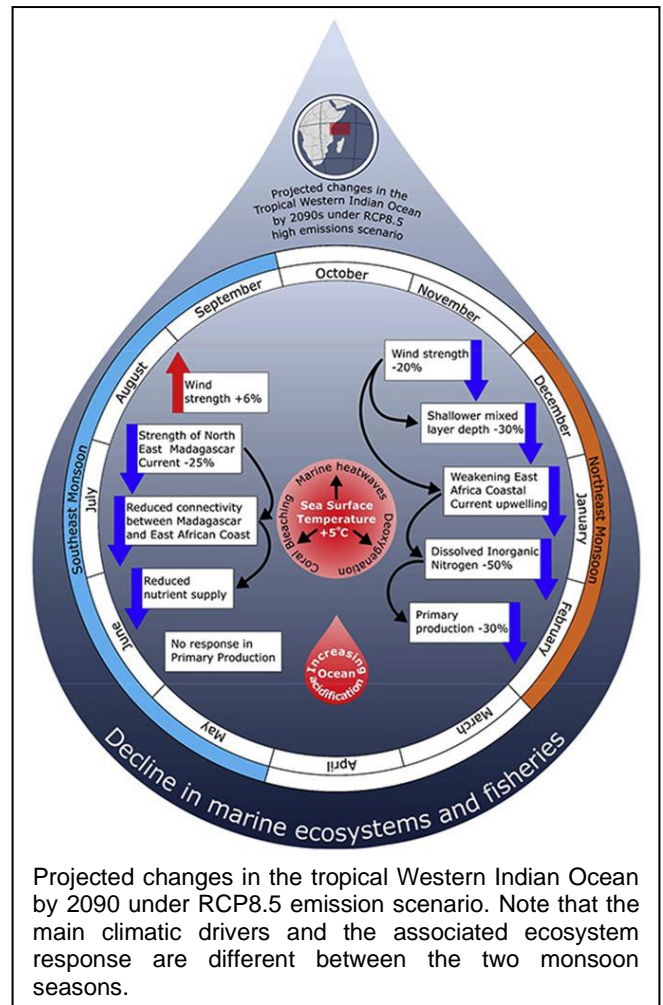
Recommendations

- Invest in and grow local capacity to collect, share and interpret information on fisheries catch and fishing effort, abundance, distribution and behaviour of key fish species within the context of impacts by key climatic stressors such as marine heatwaves.
- Ensure that National Climate Change Adaptation Plans recognise the unique nature of the North Kenya Banks as an upwelling-driven ecosystem offering some resilience to climate change impacts
- Invest in and develop operational early warning systems to provide early indication of periods of low commercial marine species catch in response to extreme events in the marine environment.
- Develop or amend Fisheries Management Plans to include risks associated with climate change and provide mitigation measures for changes already experienced and predicted in the near future.

The information presented in this Summary for Policy Makers is based on the following open access publications:

J.Kamau et al., **Managing emerging fisheries of the North Kenya Banks in the context of environmental change**. Ocean Coast Manag. <https://doi.org/10.1016/j.ocecoaman.2021.105671>

Z.Jacobs et al., **Key climate change stressors of marine ecosystems along the path of the East African Coastal Current**. Ocean Coast Manag., <https://doi.org/10.1016/j.ocecoaman.2021.105627>



What are the key climate change impacts on Kenyan marine ecosystems?



Rising ocean temperatures will negatively impact marine organisms living close to their thermal tolerances. Under RCP8.5 emission scenario, the sea surface temperatures in Kenyan waters is expected to increase by 4-5 °C by the end of the century.



Marine heatwaves (intense short-term events) will become more intense and will last longer. Coral ecosystems are especially vulnerable to such events.



Reduced ocean mixing will bring less nutrients to the surface and **ocean productivity will decline**.



Warmer water holds **less oxygen**. Many types of fish and shellfish will struggle to survive in low oxygen conditions. Some species will migrate away from their current habitats.



Climate change will **alter local ocean currents**. Many marine animals rely on these to disperse eggs and larvae; other rely on them for food. These changes will alter the distribution of fish species and connectivity between MPAs.



Upwelling supplies nutrients from deeper waters fertilising the surface ocean along the Kenyan shelves. Climate change will **impact upwelling regimes** changing food availability for fish.



Sea levels are rising due to climate change. This leads to flooding and wave erosion along the coast damaging mangrove forests and seagrass meadows.



Increased carbon dioxide levels in the atmosphere makes the ocean more acidic. **Ocean acidification** will negatively impact the growth of coral, shellfish and fish.



When **climate change impacts occur simultaneously**, they can amplify each other. This will lead to greater negative impact on the ecosystems.