



# SOLSTICE

## SAPPHIRE PROJECT



July 2021

## Towards a joint management of the living resources in the Pemba Channel

Part 2. Accelerating Climate Change impacts on marine ecosystems in Tanzania – what to be prepared for?





## SUMMARY OF POLICY-RELEVANT INFORMATION

### Accelerating climate change impacts on marine ecosystems in Tanzania – what to be prepared for?<sup>1</sup>

#### Key Messages:

The Tanzanian marine environment is entering a period of rapid change and uncertainty brought about by anthropogenic climate change.

The accelerating negative impacts of climate change on marine ecosystems have considerable socio-economic implications for coastal populations

Integrate climate change impacts on marine ecosystems into the country's strategic plans for marine food security, blue economy and fishery policies

Invest into local research capacity to access, analyse and interpret available climate-related information and future climate projections to improve usage in national policy

**Climate change will impact Tanzanian 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 Tanzanian marine waters is no longer a possibility for the distant future. Marine ecosystems are feeling these impacts now. Fish are already migrating towards cooler regions in response to rising ocean temperatures. 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 are becoming more frequent and more intense. Recent scientific research shows that **the first year-long marine heatwave may occur in Tanzanian EEZ waters as early as the 2030s.**

#### Why is joint management of the Tanzanian living marine resources critical for climate change adaptation?

While climate change is happening worldwide, it manifests in different ways regionally and is influenced by local factors. The Pemba, Zanzibar and Mafia channels are each driven by a different set of factors and will respond differently to climate change. Due to its substantial depth (up to 800 m) and strong flushing by a fast oceanic current, it is expected that the Pemba Channel may respond to climate change differently compared to the shallow Zanzibar (~40 m deep) and Mafia (<10 m deep) channels. The presence of cooler ocean temperatures and higher nutrient concentrations induced by upwelling may provide delayed onset of some climate change impacts in the Pemba Channel relative to the rest of the Tanzanian shelf waters. At the same time deep ocean upwelling may lead to earlier onset of ocean acidification and deoxygenation. These climatic drivers will equally impact both sides of Pemba Channel. Thus, coastal communities will benefit from common climate change adaptation strategies and sharing of information.

<sup>1</sup> This SUMMARY is one of the three documents produced under a series 'Towards a joint management of the living resources in the Pemba Channel'. The other two documents are: Part 1: Oceanographic underpinning; Part 3: Joint management of the small pelagics in the Pemba and Zanzibar Channels

## Current knowledge of the climate change impacts on marine ecosystems of Tanzania

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 with a considerable amount of open access information now available. An increased 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 between analyses of climate impacts and understanding their consequences for communities and economic sectors.** Projections of such **system-level responses**, which take into consideration specifics of the Tanzanian region, should be at the core of determining climate change adaptation options.

## Recommendations

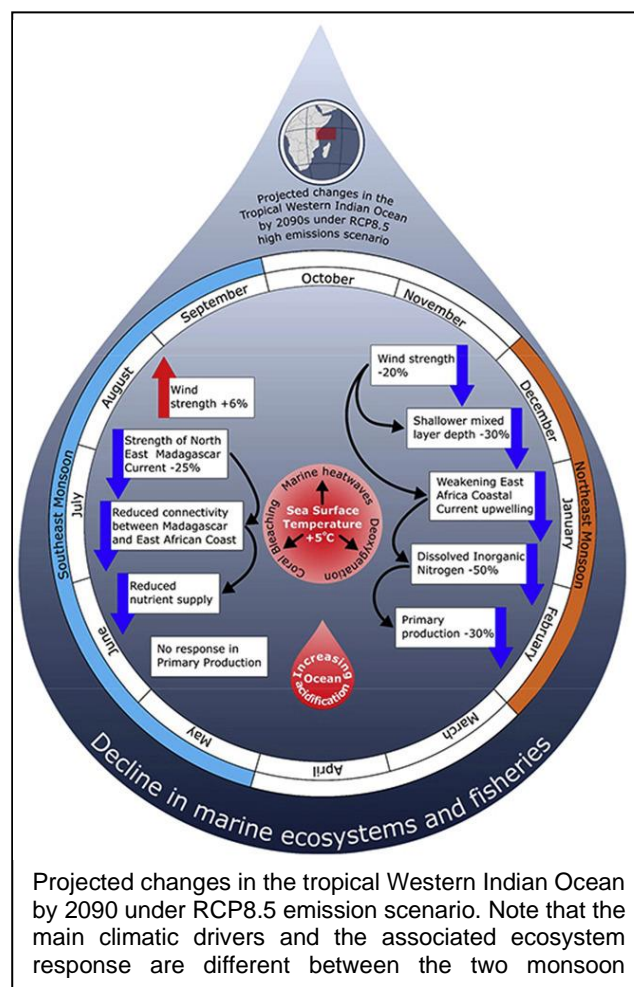
- Ensure that National Climate Change Adaptation Plans recognise the unique nature of the Pemba Channel as an upwelling-driven ecosystem with its higher resilience to climate change
- Improve collection, management, and sharing of information on the catch and effort, abundance, distribution and behaviour of the key species. Grow local capacity to interpret this information in a context of the key climatic stressors such as marine heatwaves and anomalous monsoon regimes.
- Ensure that Fisheries Management Plans assess risks and provide mitigation measures for the changes currently experienced as well as predicted future change. Allow for adjustment of management measures as new information becomes available.

The information presented in this brief is based on the following open access publications:

B. Sekadende et al., **The small pelagic fishery of the Pemba Channel, Tanzania: what we know and what we need to know for management under climate change.**, Ocean Coast Manag., 197 (2020), p. 105322. <https://doi.org/10.1016/j.ocecoaman.2020.105322>

Y. Shaghude et al., **Seasonal variations of remotely-sensed Chl-a and associated physical conditions in the Tanzanian channels.**

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>



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## What are the key climate change impacts on Tanzanian 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 Tanzanian waters is expected to increase by 4-5 °C by the end of the century.

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

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

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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.

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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.

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

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

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

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