

Ghanaian Artisanal Fisheries: Adapting to Climate Change

Why this policy brief?

In Ghana, many changes relevant to fisheries are being seen that can be linked with climate change. Changes in abundance, size, and distribution of many different fish stocks are being reported by fisherfolk and fisheries managers in Ghana, and weather patterns are changing. This is important, because Ghana's predominantly artisanal fisheries are considered to have high climate vulnerability due to their exposure to climate hazards, with stocks that are already under high fishing pressure. In addition, coastal communities are highly dependent on fisheries resources for food security. Is there potential to reduce this vulnerability in Ghana, and make fisheries more 'climate-smart'?

What are climate-smart fisheries?

Climate-smart fisheries ensure that fisherfolk incomes are secure in the future, while improving the condition of fish stocks and the marine environment. Actions to create climate-smart fisheries can be taken at the local scale without the need for large grants to make changes at the community level (Townhill et al., 2021).

Introduction: climate change, fisheries, and livelihoods

The Republic of Ghana is located in West Africa, on the coast of the Gulf of Guinea. Ghana's artisanal fisheries sector accounts for more than half the country's supply of fish for consumption and supports the livelihoods of around three million people. Ghana is also home to important marine and coastal habitats such as seagrass beds and mangroves that are crucial for supporting fisheries.

A wide range of fish species are caught by the artisanal fisheries of Ghana, using a variety of fishing gears. Ghanaian fisherfolk catch offshore and inshore pelagic species such as tuna, shark, mackerel, anchovy and sardinella using hooklines and mixed gears. Demersal species such as snappers, groupers, dentex, and croakers are caught in coastal areas using purse and beach seines and set nets.

Climate change and other pressures such as overfishing pose significant threats to the livelihoods of coastal communities – as demonstrated by a recent climate change risk assessment (Townhill et al., 2023). This policy brief contains key messages that emerged from a workshop held in October 2023 in Keta, Volta Region, attended by fisherfolk, policy makers, scientists, and other stakeholders. The workshop's aim was to identify actions that can be taken to adapt fisheries to climate change in Ghana. We hope that the recommendations proposed here, can help them to become more 'climate-smart', and reduce climate vulnerability in Ghana's fisheries.



Ghana Climate Change Impacts

Warming seas

In 1993, average sea surface temperature (SST) in the Gulf of Guinea was 27.7°C, but it has increased by approximately 0.3°C between 1993-2020 (Dahunsi et al., 2023). This trend is similarly recorded in the tropical Atlantic. Stronger warming in the northern basin, including the Gulf of Guinea is thought to be linked to decreasing intensity of upwelling around the West African coast (Koné et al., 2022). This could lead to further changes in the timing and intensity of coastal upwelling, potentially reducing productivity in all sectors of Ghana's fisheries.

Sea level rise and coastal flooding

West Africa as a region is expected to experience as much as one meter of sea level rise by the end of the century, which is 10% higher than the global average under a 4°C global warming scenario (Serdeczny et al., 2017). This could lead to increased coastal erosion and flooding and more damage and disruption to fishing activities, but it may also cause saline intrusion to groundwater reservoirs. Coastal erosion is a significant issue related to sea level rise and increased frequency of storm surges as a result of climate change (The World Bank Group, 2021).



Ocean acidification

According to the Intergovernmental Panel on Climate Change (IPCC, 2019), ocean acidification is a major stressor affecting global marine ecosystems. The impacts of ocean acidification, in combination with other stressors, include direct effects on fish physiology and distribution, and disruption to marine food chains, as well as wider socioeconomic impacts (Dupont & Pörtner, 2013). In Ghana, this could result in more fishing effort needed for decreasing catches, as localised depletions could lead to fishers travelling further distances to reach stocks. This in turn puts safety at risk and increases fuel costs (Quansah, 2014).

Other stressors affecting Ghana's marine environment

High fishing pressure exacerbates the negative effects of climate change on marine fisheries (Cook et al., 2021). The small pelagics fishery in particular (e.g. *Sardinella*) is the most important for Ghana's food security, and has seen the largest decline in catches of around 60% between 1996 and 2011 (Ameyaw et al., 2021; Cook et al., 2021). There were around 14,000 canoes operating in Ghana's small-scale fisheries in 2016, a number that has continued to grow; in addition, many industrial trawlers fish in the offshore zone. This overcapacity in the fishing fleet operating in Ghana is leading to conflicts through increased competition and resource degradation (Ameyaw et al., 2021). In addition, the marine environment along the entire coastline of Ghana is experiencing impacts from many other human activities. These include land based pollution, erosion from sand mining, habitat damage, marine litter and overfishing. Collectively, these cause stress to marine and coastal ecosystems, and further reduce the resilience of fish stocks, and the ability of fisheries to adapt to climate change.

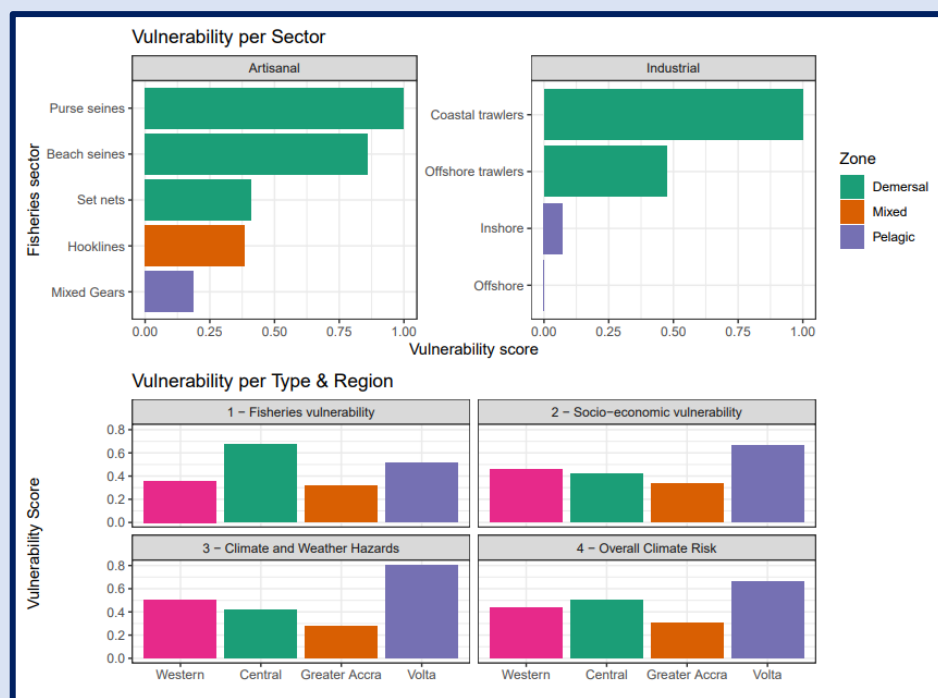


Climate Risk and Vulnerability in Ghanaian Fisheries

The impacts described above will likely have negative consequences for Ghana's fisheries. They may lead to changing fish distributions and abundance, and to degradation of marine habitats and their ability to support healthy fish stocks. These impacts could also result in higher risks to fisherfolk safety, as well as damage to equipment, increasing the vulnerability of the communities these fisheries support.

A climate change risk assessment of Ghana's artisanal fisheries was published recently, carried out under the One Ocean Hub programme (Townhill et al., 2023). This showed that some species constituting the highest catches of the artisanal fleets are the most sensitive to climate change. The near total dependence of coastal communities on marine fisheries for income and food security, combined with a high exposure to climatic hazards such as high windspeeds and rainfall result in an overall very high vulnerability to climate change. On top of this, the adaptive capacity of Ghana's coastal communities is currently very low due to various social and economic challenges, and this needs to be addressed to implement effective adaptation measures.

The World Bank (World Bank Group, 2022) estimates that climate change in Ghana could have high economic consequences. Poverty rates could increase by 1 to 2 percentage points by 2050, due to climate change impacts on agriculture, infrastructure, and transport, which is equal to around one million people when compared to a scenario with no climate change. Poorer households will be disproportionately affected due to high reliance on vulnerable industries. Their income could decrease by 40% by 2050 if no climate action is taken.



Top: Vulnerability scores of artisanal and industrial fishing sectors in Ghana. A score of 1 equals the highest vulnerability.

Bottom: Vulnerability scores by coastal region for three different risk types. Overall climate risk score calculated for each region, where 1 equals highest vulnerability (Townhill et al., 2023).

Climate Adaptation Workshop

The workshop was organised by One Ocean Hub to provide international collaboration between UK and Ghanaian partners conscious of the vulnerability faced by Ghana's fisheries. The workshop was held in the Volta region of Ghana, with local fisherfolk and stakeholders from the University of Cape Coast, Ghana Fisheries Commission, the Land Use and Spatial Planning Authority (LUSPA), and the not-for-profit organisation Hen Mpoano. Aimed specifically at finding climate adaptation options for the artisanal fisheries sector, workshop participants discussed whether they felt the climate risk assessment accurately captures the relevant climate change impacts for Ghana's fisheries. They also discussed their current experiences of climate change, how people of Ghana are already adapting to the impacts, and what might be barriers to adaptation – as well as how these could be overcome.

Changes that fishers have already observed in Ghana

During the workshop, stakeholders reported that the following changes are already being observed:

- Increased sea temperature
- Increased flooding and drought
- Rougher conditions at sea
- Changes in peak fishing times
- More coastal erosion
- More mangrove deforestation
- Changes in lagoon-sea exchange
- Sea level rise
- Increased time spent fishing at sea
- Abnormal rain patterns
- Increased cost of fishing
- Weakened upwelling
- Decreased fish landings

Adaptation already underway in Ghana

During the workshop, fisherfolk highlighted that – at an individual or local level – they have begun adapting to climate change in the following ways:

- Changed fishing times (both season and time of day) to reduce risk of capsizing and loss of life, in response to an increase in poor weather conditions
- Increased irrigation farming as an alternative to fishing
- Increased aquaculture, either as supplementary or alternative livelihood
- Use of ice boxes when travelling further distances to catch fish, to enhance preservation
- Human migration to other countries such as Togo and Côte d'Ivoire
- Increased lagoon fishing when seas are rough
- Increased IUU (illegal, unreported and unregulated) fishing (e.g. light fishing)

In addition to the actions being taken at the local level in coastal communities, the following large-scale projects are underway in Ghana to help adapt to climate change:

Enhancement of sea defences

Several sea defence projects have been carried out by the government of Ghana in highly vulnerable coastal areas (e.g., Keta, Ada, Sakumono, New Takoradi, Komenda and Elmina, and Cape Coast). These defences will help safeguard coastal resources from erosion and the impacts of sand mining.

Coastal resilience

'Seawater Solutions' have led projects in the Volta and Greater Accra regions to establish networks of saltmarshes and aquaculture sites along the coastline. This involves mangrove reforestation to provide socio-economic benefits to local communities, while enhancing natural flood defences.

Green Ghana Project

The Government launched the Green Ghana project through the Ministry of Lands and Natural Resources in 2021 with the aim of planting five million trees throughout Ghana to address habitat degradation and contribute to climate change mitigation.



Feed the Future Ghana Fisheries Recovery Activity (GFRA)

This five-year (2021-2026) activity funded by the United States Agency for International Development (USAID) aims to mitigate the potential collapse of Ghana's small pelagic fisheries by reducing overcapacity. GFRA operates in small coastal fishing communities to encourage sustainability and marine conservation, whilst also improving resilience, well-being and food security.

Mangroves as Nature-based Solutions to Coastal Hazards (MANCOGA)

Running from 2022-2025, this project led by MeerWissen (African-German Partners for Ocean Knowledge) aims to develop decision support tools for mitigating erosion and flooding on the East coast of Ghana, using mangroves as a nature-based solution to climate related damage and pollution, whilst increasing community resilience in the process.

Identifying further actions for adaptation to climate change

Everyone can be involved in climate change adaptation. We received stakeholders' views on:

- Short term actions that can be implemented relatively quickly at the local scale, by fisherfolk, or by managers and fisheries support groups;
- Longer-term actions which may take more planning, funding, and research to implement.

We also identified further potential options based on desk-based studies and previous experience from One Ocean Hub scientists, combined with outputs from the workshop:

Short-term, local scale climate-smart actions for fisherfolk

Making fisheries climate-smart means fishers can help secure incomes and food supply in the future. Many actions can be taken at the local level without relying on government or funding grants.

Repeating successes from other individuals, communities or countries in similar situations can benefit climate change adaptation, whilst also saving money and improving safety.

Potential adaptation actions include:

- Choosing an alternative or supplementary livelihood for income
- Diversifying the fish market, encouraging catches of less sensitive species (e.g. Atlantic bumper, Bogue, Canary dentex)
- Relocating to areas where stocks are not depleted
- Adjusting the target species depending on season and availability
- Adding value to catches (e.g., by using ice boxes while at sea, and/or by canning or packaging)

Medium-term actions for chief fishers and supporting groups of fisherfolk

There are actions that can be implemented by chief fishers or by cooperative groups working to support fishing communities. They can help build stronger fish populations, improve the health of the marine environment, and encourage members of coastal communities to act on climate impacts through:

- Educating fisherfolk in sea safety, climate change and 'ocean literacy'
- Local language translation of training and education
- Training in business skills and personal finance
- Monitoring fish landings and stocks
- Discouraging use of damaging fishing gear and practices
- Surveillance and reporting of illegal beach sand mining
- Ecosystem enhancement (e.g., mangrove replanting)
- Building groynes to stabilise the coastline
- Fish Aggregating Devices (FADs) to concentrate pelagic fish (if managed sustainably)



Longer-term goals and higher-level actions for government and science

Some actions will have a much larger impact on the artisanal fisheries sector, but need to be implemented in the long term as they require more funding and further research to be effective. The Fisheries Management Plan of Ghana (2022-2026: <https://chinaglobalsouth.com/wp-content/uploads/2015/05/FINAL-DRAFT-2022-2026-MFMP-MFMD-28-APR.pdf>) aims to reduce excessive pressure on fish stocks, ensuring they stay within sustainable levels, as well as protecting marine habitats and biodiversity (Akpalu et al., 2018). Traditional practices and customary law can be useful when developing adaptation plans. Long-term actions could include:

- Establishing a clear definition for, and enforcement of, the inshore zone
- Providing affordable housing units at sites less vulnerable to climate change
- Providing electricity and access to the national grid in coastal communities
- Development of Marine Protected Areas
- Providing insurance schemes and financing for safer, more storm-proof vessel infrastructure
- Improving management and surveillance of fish stocks and their status
- improved communication and collaboration between government workstreams and research projects
- Adding national level climate change adaptation mechanisms down to local level byelaws
- Adopting new advances in technology, particularly fishing vessels, gears and onboard preservation of fish, while avoiding overcapacity in the fishing fleet

Reducing non-climatic human pressures

There are pressures on the marine environment which affect the health of fish habitats and stocks, including land-based pollution, practices causing erosion, habitat damage, overfishing, litter and ghost gear. These cause additional stresses to marine ecosystems which makes them less resilient to climate change. Actions to reduce these pressures will help ecosystems become more resilient, and better able to support healthy fisheries. These include:

- Preventing and removing litter and ghost gear
- Use of correct waste facilities for disposal of damaged gear and litter
- Protection laws for important habitats such as mangroves
- Limiting further habitat degradation
- Support for sustainable dredging,
- Land reclamation, mangrove planting, limiting erosion and other nature-based solutions
- Proper enforcement of illegal beach sand mining laws

All the above actions were strongly supported during the stakeholder workshop.



Identifying possible barriers to adaptation



We asked participants of the workshop to discuss the current barriers that prevent both small- and large-scale climate change adaptation in Ghana. Combined with evidence from desk-based research and previous similar studies, a number of factors were identified that could be inhibiting artisanal fisheries' ability to adapt. Therefore, measures need to be taken to overcome them.

- **Lack of alternative or supplementary livelihoods available.** Fisherfolk lack the training or desire to leave the fishing industry. There is a fear that moving away from fishing will result in a lost sense of community and tradition.
- **Cost of transport.** Fuel for vessels is becoming increasingly more expensive, reducing the viability of travelling further distances to catch fish. Similarly, fishers are unable to afford the fuel required to move away from climate vulnerable areas, such as locations with a high flood risk.
- **Limited space for fishers.** The number of people joining the fishing industry continues to increase, leading to competition for access to fish. Additionally, a lack of transparency around the boundaries between the inshore and offshore zones has led to reports of industrial fleets encroaching into artisanal fishery areas.
- **Technological challenges.** More research and development into canoe technology is needed to address impacts from climate change and other stressors. For example, the growing use of outboard motors may increase fishing effort, but also increases pollution.
- **Sea defences.** Whilst these may be useful to protect vulnerable coastlines, defences like groynes can severely disrupt demersal and beach seine fishing activities. While mangrove replanting may be a more effective option, finding space to replant is a potential barrier.
- **Limited communication.** Coastal communities can be difficult to reach due to a lack of technology and access to electricity. This can make communicating weather forecasts or emergency warnings a challenge.
- **Fish market diversification.** This requires people changing their fish preferences to species less sensitive to climate change, which they may be reluctant to do.
- **Lack of climate change knowledge.** More research is needed on the impact of climate change on Ghanaian fisheries, including monitoring stocks and local scale climate modelling to support sustainable fishing.

For fisheries to adapt effectively, strategies should be specific to each location or fleet, taking into account differences between fishery sectors and the socio-economic situation in each region. Addressing barriers and implementing suitable adaptation actions will help Ghana achieve its aims of restoring fish stocks, safeguarding livelihoods, and improving climate resilience for artisanal fishers.



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