

DISCUSSION BRIEF

Rahma Adam, Kevin Ouko, Philip Osano, Dorothy Amwata and Nicholas Ndiema

Examining the impacts of climate change on the livelihoods of fisher communities in the Lake Victoria zone region through a gender lens

Key messages

- Lake Victoria's fisheries contribute enormously to community livelihoods in terms of food, nutrition, and income.
- Understanding gender relations is crucial for shaping a gender-equal community.
- Lake Victoria fisheries have undergone some of the most intense ecological disturbances ever witnessed in a big freshwater ecosystem, attributed to both climatic and non-climatic pressures.
- Meteorological data for 1981–2022 showed a significant upward trend in minimum and maximum temperatures and rainfall. This is further corroborated by the perceptions only (independent of the data) of both women and men.
- The changes have reduced fish stocks, destroyed infrastructure, caused conflicts and diseases, and reduced incomes, leading to increased poverty and exacerbating household vulnerability.
- Interventions to increase adaptation and to enhance resilience to climate change in the fisheries value chain include 10 women and youth self-help groups acquiring solar freezers, solar tent driers, fish smoking kilns and fish display boxes.





**Lake Victoria's fisheries
currently support**

200,000+
fishers

35 million
**directly or indirectly depend
on these fisheries for a living**

Introduction

Lake Victoria's fisheries currently support more than 200,000 fishers, with an estimated 35 million people directly or indirectly depending on these fisheries for a living (Weston 2015).

Addressing the challenges at the nexus of climate change, gender and aquatic foods can also advance the United Nations Sustainable Development Goal (SDG) 13 on climate action. SDG 13 calls for urgent action to combat climate change and its impacts. In addition, it can boost SDG 5, which aims at achieving gender equality and empowering women and girls. Additionally, SDG 14 on life below water includes a strong focus on aquatic foods, and is central to the livelihoods, food, and nutrition security of more than 800 million people in developing countries. While these three SDGs are intrinsically important, they are also critical levers in achieving other SDGs through poverty reduction and enhanced food and nutrition security. The contributions of aquatic food systems (AqFS) to sustainable development include increased income, employment, food and nutrition security, family well-being, socioeconomic growth,

poverty alleviation, and bolstering climate resilience and environmental sustainability (Belton and Thilsted. 2014; Ottinger et al. 2016).

Importantly, AqFS production is heavily and inextricably dependent on the biophysical state of ocean and wetland ecosystems, which are highly vulnerable to climate change, variability, and extremes temperatures (Hoegh-Guldberg and Northrop 2019; Hossain et al. 2018). Despite the fact that worldwide policy guidance for fisheries and aquaculture emphasizes the importance of gender equality, youth empowerment and social inclusion, women and youth are still being excluded—at all scales—from decision-making that delivers climate resilience (Food and Agriculture Organization [FAO] 2018; Kleiber et al. 2017; Baker-Médard 2017; Nunan and Cepić 2020; Rohe et al 2018; Lawless et al. 2019; Hossain et al. 2021). In addition, AqFS climate policy and practices are hindered by outdated and misleading gender assumptions, e.g. the assumption that gender inequality can be addressed solely by increasing the number of women in climate adaptation, mitigation,

policy, and practices (Lau et al. 2021). Gender analysis in 17 countries anchored in the Illuminating Hidden Harvests (IHH) Project has uncovered the “sexist data structures” that contribute to this gender blindness (Kleiber et al. in press). These gender-blind statistics create gender-blind policies, which in turn reinforce gender barriers by framing fisheries as a “men’s domain” (Kleiber et al. in press), effectively excluding women in decision-making processes that can deliver resilience (Hossain et al. 2021).

Due to sociocultural dynamics, women in developing countries have often been restricted from accessing natural resources (e.g. land), information and services, which has limited their involvement in production and has often restricted women’s involvement in supplementary fish-farming activities and fishing methods considered to be feminine, e.g. fishing in small pools of water along rivers, seaweed farming, mud-crab fishing, processing and gleaning (Cuaton 2019; Thomas et al. 2019; Thorpe et al. 2014; Hossain et al. 2021). Men generally travel far in search of fish,

while women are confined to wetlands near their communities and to domestic activities (Moser 2015). Similarly, while both men and women suffer the consequences of environmental degradation and climate change, the impact on women is typically more severe (Treviño and Murillo-Sandoval 2021), resulting in increased vulnerability for women and their families (Moser 2015; Thomas et al. 2019; Manyungwa et al. 2019). Hence, policies, plans, and strategies for improving the lives and livelihoods of women and youth—in light of the climate change, gender, and AqFS nexus—are critical for equitable, resilient and sustainable AqFS.

This discussion brief explores the impacts of climate change on fishers’ livelihoods in Kenya’s Homa Bay and Migori counties and identifies priority actions for enhancing the resilience of climate-change vulnerable fisher communities, including women and youth.

While both men and women
suffer the consequences of
environmental degradation and
climate change, **the impact on
women is typically more severe**

What is at stake? The state of fisheries in Kenya's Lake Victoria Zone Region

Kenya's fisheries contribute about 0.8% of the gross domestic production (GDP), making the sector critical to the country's economic and social growth (Government of Kenya [GoK] 2022). It is estimated that the sector directly and indirectly supports approximately one million people—working as fisher crews, traders, processors, suppliers, and merchants. About 90% of people engaged in the sector rely on fish from freshwater bodies—particularly Lake Victoria—which accounts for 69% of the total freshwater fish production (GoK 2022). Kenya's inland waters have a fisheries potential of between 150,000 and 300,000 metric tons (MT), primarily from commercial fishing (Munguti et al. 2021). Currently, the lake's fishery is dominated by two introduced species—Nile perch (*Lates niloticus* L.) and Nile tilapia (*Oreochromis niloticus* L.), and Silver cyprinid (*Rastrineobola argentea*) also known as the Lake Victoria sardine, *mukene*, and *omena* (native language), *dagaa* (Swahili) (Obiero et al. 2015). Lake Victoria is the world's largest tropical lake. The lake is shared between Kenya (6%), Uganda (43%) and Tanzania (51%). It has a mean depth of 40 meters (m), maximum depth of 84 m and a shoreline of 3,450 km, a water retention time of 140 years and a catchment area of 193,000 square kilometers, which extends into Rwanda and Burundi (Aura et al. 2019).

Fisheries are an important entry point and opportunity for women's economic and social empowerment (International Union for Conservation of Nature [IUCN] 2019). Women make up 21% of all workers in the fisheries and aquaculture sector globally, and more than half of all workers in the total aquatic value

chain—including pre- and postharvest (FAO 2023). Identifying where the women are in the fisheries value chain has much to contribute to the sustainability of fisheries ecosystems, mitigation, and adaptation measures of climate change, and to socioeconomic development at household and community levels (Bradford and Katikiro 2019).

The lake has been experiencing a lot of changes. Specifically, an increasing human population and human-driven activities such as farming, disposal of urban sewage, overexploitation of natural resources and introduction of exotic species, and the growth of water hyacinth. All these factors have had profound negative physical, chemical, biological, and ecological effects on the lake, altering its ecosystem (Kolding et al. 2008; Lung'Ayia et al. 2000; Mugidde et al. 2005). Most importantly, climate change has adversely affected Lake Victoria's fisheries and fishery-dependent livelihoods. As the poor are the most affected, there is a growing concern on social equity and justice in fisheries. Climate change threatens small-scale fishers (SSFs) the most: their vulnerability is exacerbated by other socioeconomic challenges such as extreme poverty (Hanich et al. 2018). The negative changes include eroded fish stocks, destroyed infrastructure, caused conflicts and disease, and decreased incomes, thereby increasing poverty and exacerbating household vulnerability. To this end, this study investigated the impacts of climate change on the livelihoods of the lake's fisher communities through a gender lens. In addition, it also explored how fisher communities mitigate and adapt to climate change.

Kenya's fisheries contribute

0.8%

of GDP

Women make up

21%

of all workers in the fisheries and aquaculture sector globally

150,000 – 300,000 MT

fisheries potential of Kenya's inland waters

Lake Victoria is the
**world's largest
tropical lake.**

Study scope, objectives, design, and methodology

The study was carried out in selected wards in Migori and Homa Bay counties (Figure 1). Due to prevailing high poverty, both counties are highly vulnerable to climate change. Poverty levels in Migori and Homa Bay counties are approximately 46.7% and 48% respectively as documented in the County Integrated Development Plans (CIDPs) (County Government of Migori [CGoM] 2023; County Government of Homa Bay [CGoHB] 2023a). These poverty rates are higher than the national poverty rate of 45.9%.

The specific objectives of the study were: (i) to assess the knowledge and perceptions of climatic and environmental change and variability, (ii) to identify the effects of changes in rainfall and temperature on livelihoods; (iii) to assess the coping and adaptation strategies to deal with climate and other environmental changes; and (iv) to identify climate change adaptation, constraints and opportunities for women, youth, and other vulnerable populations in Kenya's Lake Victoria Zone Region.

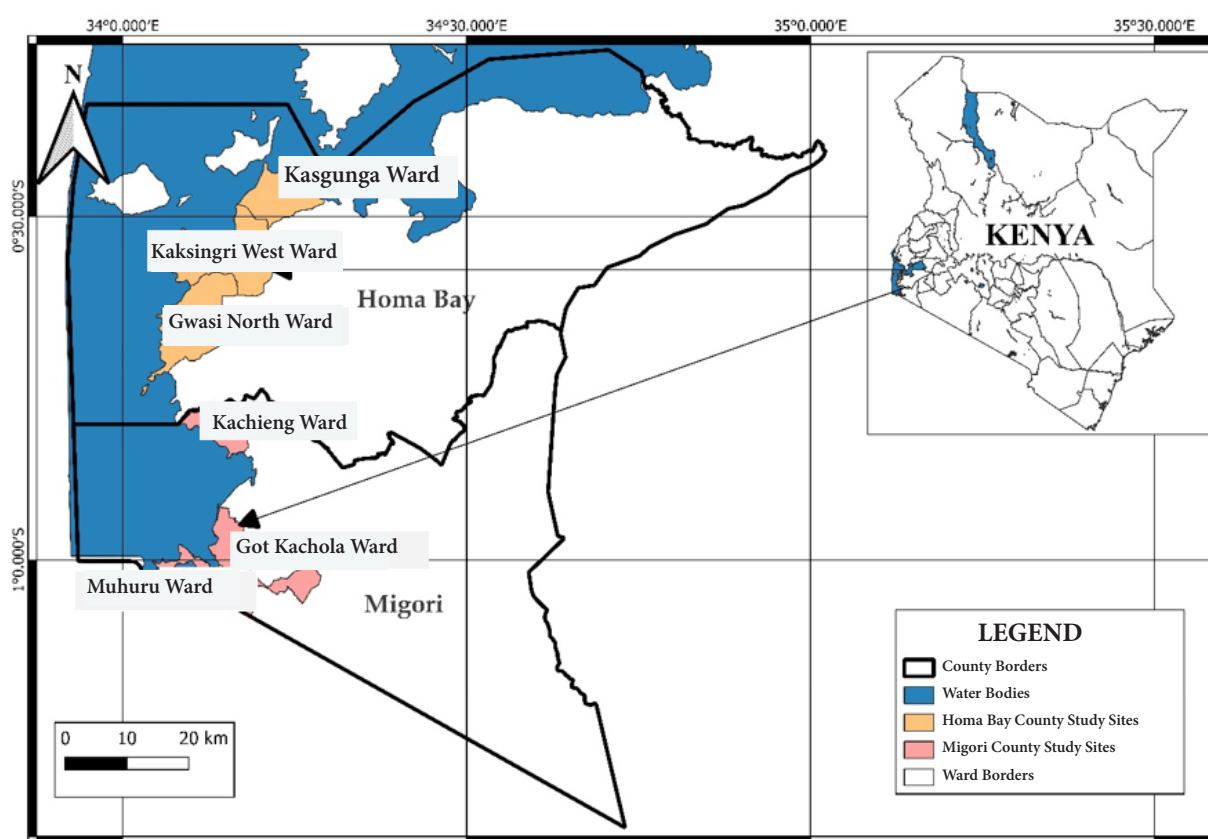


Figure 1. Study areas

The study adopted a cross-sectional research design and a mixed-methods approach for data collection, which was conducted from March to July 2023. The methodology entailed a triangulation approach of qualitative and quantitative data. Primary data from fish value chain actors were collected. A total of 477 respondents (41.9% from Homa Bay and 58.1% from Migori) participated in answering the structured questionnaire. Women respondents were 23.5%

in Homa Bay and 21.37% in Migori. There were 42 key informant interviews (KIIs) and six focus group discussions (FGDs). Also included were 1981–2022 meteorological rainfall and temperature data for the two counties. We also summarize the interventions proposed during the multi-stakeholder workshop in Migori County in September 2023.

Summary of key findings

The study revealed that:

- There were perceived severity and variations in temperature, rainfall, and flood occurrence. The rainfall pattern in the last five years was unpredictable with no clear pattern on the hottest or coldest years. Similarly, the community members reported 2019 and 2020 as the years with the highest occurrence of floods in the region. This is in line with the real trend analysis done on Kenya's meteorological rainfall variables (1981–2022) (Figures 2 and 3). Similarly, the communities reported increased temperatures throughout the year and noted that dry months have become hotter over the last 10 years (Figure 4).

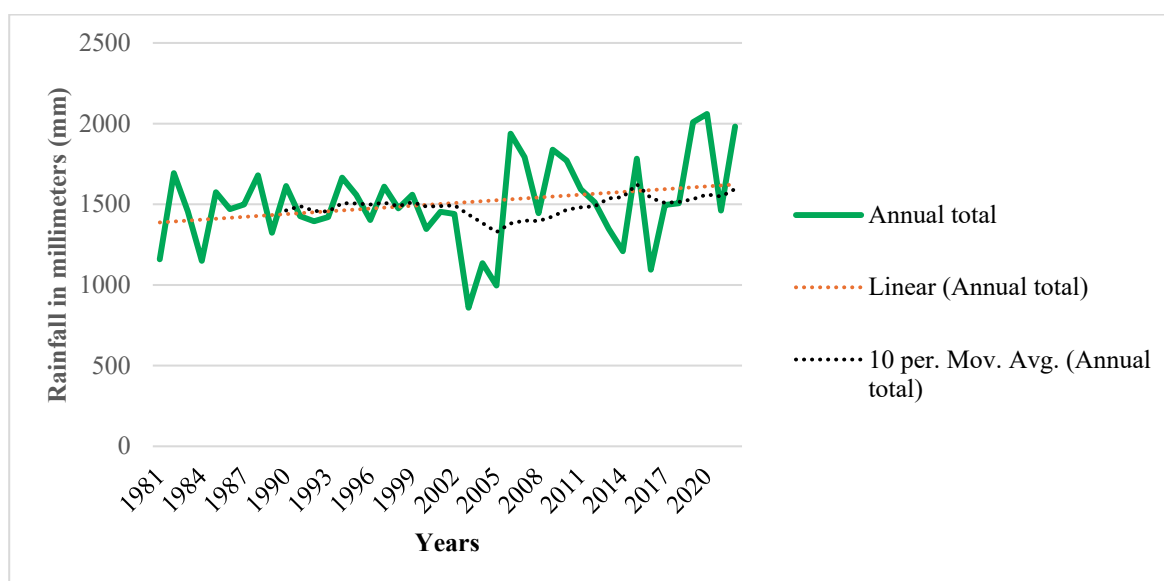


Figure 2. Annual total rainfall in millimeters (mm) in Migori County (1981-2022).

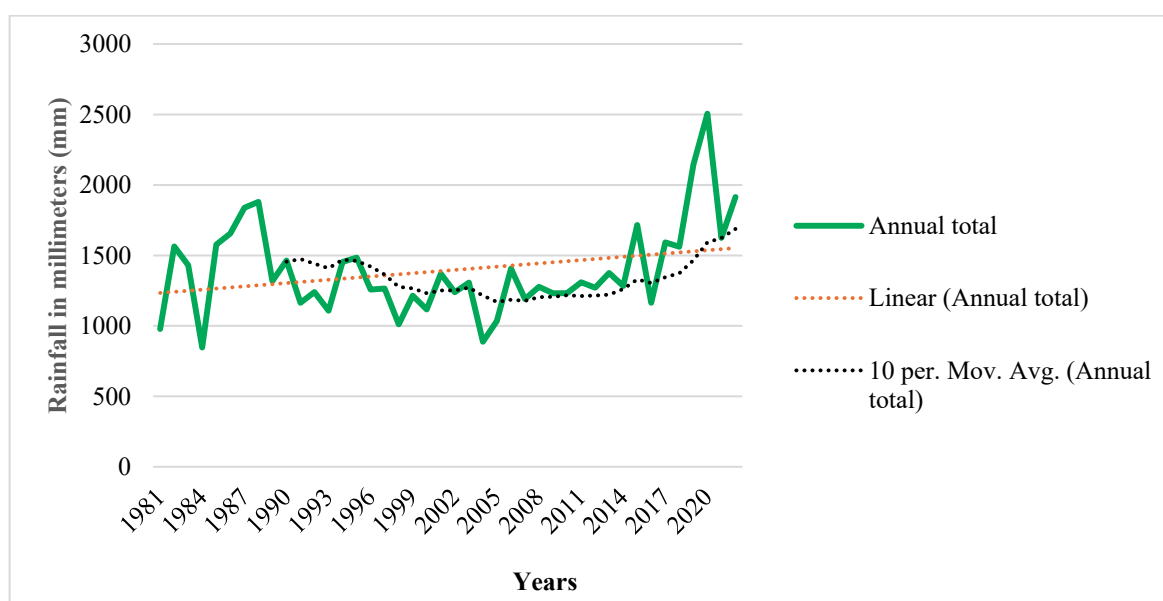


Figure 3. Annual total rainfall in millimeters (mm) in Homa Bay County (1981-2022).

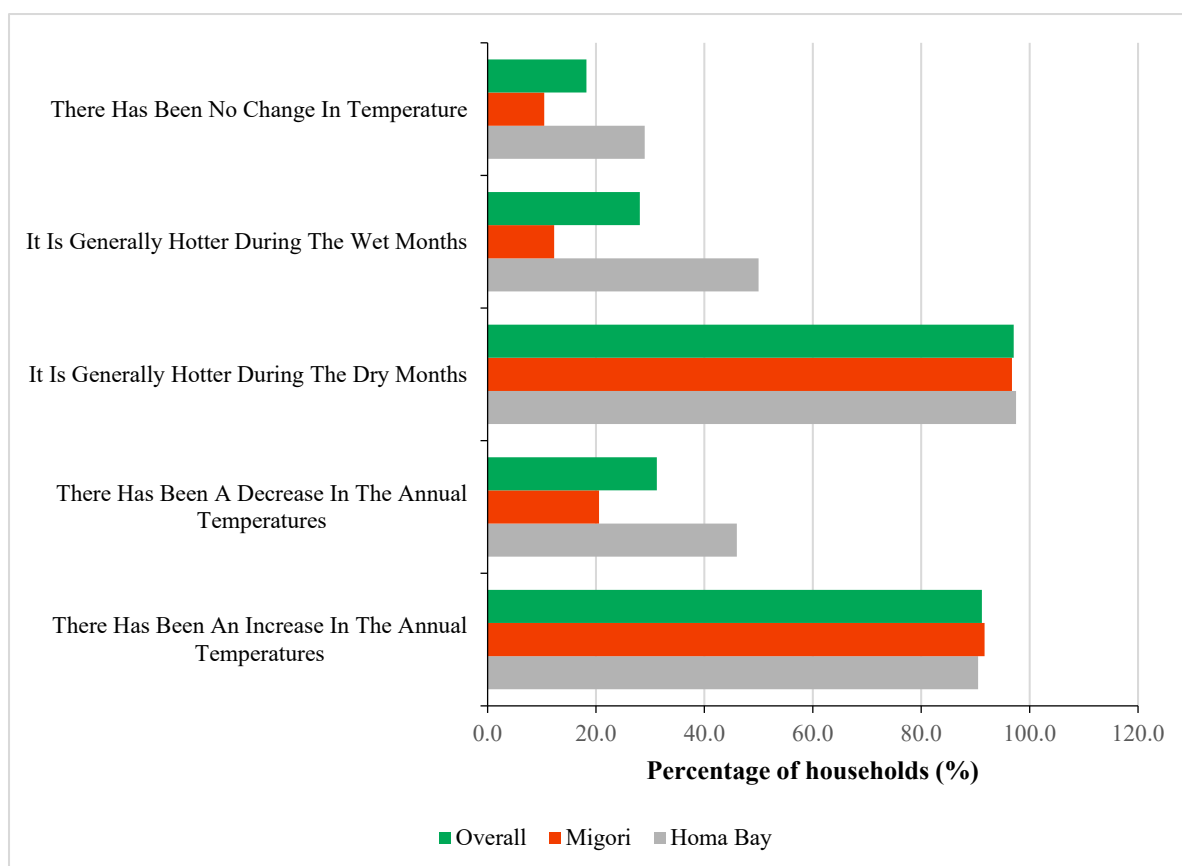


Figure 4. Perception of temperature changes in Migori and Homa Bay counties

- Climate change and over-exploitation of fisheries have altered the species composition of fisheries catches leading to a decline in the number of species, amount and sizes of fish caught in Lake Victoria.
- Rising water levels have led to the destruction of fish landing sites, business premises, boats, gear, and fishing equipment.
- There have been increased household conflicts, attributed to many hours spent in the lake catching fish, decreased access to food, reduced incomes, family displacements due to flooding and increased disease outbreaks attributed to water pollution, especially during the rainy season.
- The gender dimensions of the lake's fisheries have led to inequities. Most fishing boats and gear are owned by men, and fishing activities are dominated by men, mostly youth. Due to the decline in catches, there is an increase in fish prices, which makes it difficult for women—who mainly earn from postharvest activities—to purchase fish from the fishermen. Youth form the largest proportion of the population

in the communities but due to lack of job opportunities and poor income from fishing, they resort to drug and substance abuse, which has affected the availability of productive labor. Persons with disabilities (PWD)s have limited income opportunities from fisheries. Most are not able to go fishing and are not able to adequately participate in leadership and decision-making processes of community-level fishery co-management organizations like Beach Management Units (BMUs). Findings on income from the fish value chain revealed that on average every week in Homa Bay, men earned 40,000 Kenya shillings (KES) (285.71 United States dollars [USD]) while women took home KES 20,000 (USD 142.85). In Migori, men earned KES 15,000 (USD 107.14) while women earned KES 80,000 (USD 571.43). These figures are relatively higher than the national average weekly wage income from fishing of KES. 7,262.1 (USD 51.87) (GoK 2022). The gender difference in average weekly income in the two counties can be attributed to women being more involved in social groups and cooperative societies in Migori than in Homa Bay, which is associated with access to more finances for fish business operations.

Challenges in and constraints to climate change adaptation

The study revealed that there are many challenges and constraints to climate change adaptation along the fisheries value chain (Table 1).

Table 1. Constraints to climate change adaptation in Migori and Homa Bay counties

Value chain stage	Constraints	Common constraints
Pre-harvest	• Cultural norms, customs, and traditional beliefs • Lack of proper transport infrastructure for fishery operations	• Limited access to credit facilities • Poor fisheries extension services • Lack of security • Climate information too technical to understand • Limited knowledge of climate adaptation measures • Inadequate understanding and enforcement of fisheries policies and laws
Harvest/fishing	• Lack of reliable weather equipment to help in weather forecasting for fishing activity planning • Limited access to fishing gear (engine, nets, lines, seines, life jacket, rescue boats)	
Postharvest	• Lack of cold chain facilities and other preservation and processing technologies • Unreliable power supply • Lack of proper marketing systems and networks.	

Strengthening climate change coping and adaptation for gender equity and in fisheries

The study shows that fishers use a combination of strategies to manage climate change and variability risks. These include fishing for longer hours, going deeper into the lake, being less selective on the fish type and size, selling to selected markets—particularly to wholesalers, applying for credit to obtain capital for investing in equipment purchase and other infrastructure, and using savings to boost business. Other strategies include diversifying income sources such as by selling other commodities alongside such as vegetables.

Several opportunities were identified that can strengthen coping and adaptation and boost resilience in the fisheries value chain.

Opportunities to strengthen coping and adaptation strategies in Migori and Homa Bay counties



Financing

- Linking key actors in the value chain with potential funding sources including allocating gender-responsive budgets and responding to indicators of gender inequities.
- Revitalizing fisher networks and cooperatives, such as supporting their formation and growth for actors in the fish value chains, including BMUs.



Technology and innovation

- Developing links with industry experts to help identify, test, and implement affordable climate-smart technologies. For example, improving fuel efficiency through switching to more efficient gear types or vessels such as fiber boats.
- Promoting technology and value-addition innovations like renewable energy (solar) freezers for cold storage, smoking kilns, solar tent dryers, and appropriate fish display boxes. These technologies and innovations reduce postharvest losses and are likely to address climate change impacts, especially among women along the value chain who process and trade in fish.
- Developing and expanding aquaculture. This includes promoting cage farming to mitigate fish depletion in the lake, and the adoption of better feeds and feeding practices that are more ecosystem-friendly.
- Expanding the utility of fish products such as Nile perch fish maw (swim bladder) that has medicinal properties and commands a high price.



Education and awareness

- Knowledge integration among stakeholders to enhance fishery sustainability through information exchange on climate change, markets, available technologies, and financing options for actors in the fish value chain. Leveraging fisherfolk membership of social groups to disseminate knowledge on adaptation to climate change impacts.
- Digitization to promote quick access to fishing data and information.
- Establishing and supporting extension services, including empowering BMU leaders with knowledge on leadership, regulations, and guidelines on the proper utilization of fishery resources.



Health

- Improving health and hygiene for safety in food handling through climate-smart technologies that reduce greenhouse gas (GHG) emissions.
- Promoting climate-smart drying technologies for hygiene and food safety.
- Promoting technology-driven water cleaning and purification facilities.
- Equipping fishermen with lifesaving gear to prevent future fatalities, including lifeline tethers, line management, personal flotation devices (PFDs), man-overboard alarms, recovery devices and rescue training.



Promising policies and practices, and actual action on the ground

Responsible fisheries management in the wake of climate change entails an array of practices to sustain ecological, social, and economic systems. The opportunities identified in this study can be realized through cross-cutting improved governance and policy actions, especially regarding gender, fisheries development, and adaptation to climate change. The Kenya Fisheries (Beach Management Units) Regulations were passed in 2007 under the Fisheries Act (Cap 378), giving BMUs the rights to co-manage fisheries resources including overseeing the closing of the lake to allow multiplication of fish (GoK 2007). Similarly, the Fisheries Management and Development Act 2016 made the provision for the establishment of the Kenya Fisheries Services (KeFS) to formulate and monitor the implementation of policies on the conservation, management, and utilization of all fisheries resources (GoK 2016a). More recently, the Kenya National Adaptation Plan: 2015–2030 (GoK 2016b) and Kenya's Nationally Determined Contribution (NDC) have prioritized the need to enhance the resilience of the fisheries value chain as a key action area, and both provide for addressing gender and for the empowerment of youth and other vulnerable groups. The Fisheries Management and Development Bill (GoK 2023) also provides for the development of Fisheries Management Plans and other Fisheries Management Measures that should also consider climate change risks and incorporate gender-sensitive actions. Cooperation among the riparian countries of the Lake Victoria region remains critical for climate resilience in the fisheries sector. Among others, guiding policies include the Kenya National Policy on Gender and Development (GoK 2019), the Fisheries and Aquaculture Policy for the East Africa Community (EAC 2018), the East Africa Climate Change Policy Framework (EAC 2011a and EAC b) and the EAC Gender Policy that is aimed at ensuring that the rights of women, men, boys, and girls are promoted, protected, and realized on an equal basis.

In response to climate variability and change, the Migori County government has developed and implemented several policies and programs with a focus on adaptation and mitigation. The Migori County Fisheries and Aquaculture Act, 2016 (No 2 of 2016) provides guidance for the sustainable utilization, management and development of Fisheries, Aquaculture, and other Aquatic resources and for connected purposes (GoK 2016c). Other existing policy frameworks include Migori County Climate Change Act, 2021; Migori County Climate Change Fund Act, 2021 and Migori County Climate Change Policy and Strategic Action Plans (GoK 2021a and GoK b). In 2022, through the Devolution for Climate Change Adaptation initiative (DACCA), Migori County embarked on the climate change sensitisation exercise that aimed to help various communities cope with climate change challenges by addressing the issues of how best the communities can be supported by the devolved units to come up with appropriate climate change interventions. On the other hand, the Homa Bay County Climate Change Policy, 2021 elaborates intervention measures that can help to achieve the goal of low carbon, climate-resilient and therefore sustainable development (CGoHB 2021). Homa-Bay's mitigation actions aim to contribute to the NDCs under the County Climate Change Action Plan (CCCAP) 2021-2026. The policy also has provisions for the County to put in place mechanism to ensure and enhance the participation of the youth, women, PWDs and other vulnerable groups in climate change governance and position them to take advantage of opportunities. Further, the Homa Bay County Climate Change Action Plan 2023-2027 under the Financing Locally Led Climate Action (FLLoCA) recommends the use of appropriate technology for reliable data collection, analysis, and dissemination of climate information. This has now been implemented in the form of the Homa Bay County Climate Information Center. Some of the other regulatory and policy frameworks set up to

exploit the blue economy include Formulation of a Riparian Harmonized Fisheries Laws for the counties bordering Lake Victoria to ensure sustainable exploitation and management of the fisheries resources; and the Homa Bay County Fisheries and Aquaculture Management Act, 2023 (CGoHB 2023b).

As immediate actions to mitigate climate change and address the issues of fish postharvest losses, WorldFish in partnership with the CGIAR GENDER Impact Platform has facilitated 10 women and youth self-help groups to acquire solar freezers, solar tent driers, fish smoking kilns and fish display boxes

As immediate actions to mitigate climate change and address the issues of fish postharvest losses, WorldFish in partnership with the CGIAR GENDER Impact Platform has facilitated **10 women and youth self-help groups to acquire solar freezers, solar tent driers, fish smoking kilns and fish display boxes**



References

- Aura, C. M., Nyamweya, C. S., Njiru, J. M., Musa, S., Ogari, Z., May, L., & Wakwabi, E. (2019). Exploring the demarcation requirements of fish breeding and nursery sites to balance the exploitation, management and conservation needs of Lake Victoria ecosystem. *Fisheries Management and Ecology*, 26(5), 451-459. <https://doi.org/10.1111/fme.1231>
- Baker-Médard M. 2017. Gendering marine conservation: The politics of marine protected areas and fisheries access. *Society and Natural Resources* 30(6):723–737. <https://doi.org/10.1080/08941920.2016.1257078>
- Belton B and Thilsted SH. 2014. Fisheries in transition: Food and nutrition security implications for the global South. *Global Food Security* 3(1):59–66.
- Bradford K and Katikiro RE. 2019. Fighting the tides: A review of gender and fisheries in Tanzania. *Fisheries Research* 216:79–88. <https://doi.org/10.1016/j.fishres.2019.04.003>
- [CGoHB] County Government of Homa Bay. 2021. Homa Bay County Climate Change Policy <https://repository.kippra.or.ke/handle/123456789/3551>
- [CGoHB] County Government of Homa Bay. 2023a. Homa Bay County Integrated Development Plan 2023–2027. <https://repository.kippra.or.ke/handle/123456789/4354>
- [CGoHB] County Government of Homa Bay. 2023b. The County Government of Homa Bay Fisheries and Aquaculture Management Bill, 2023. https://www.slo-countybills.go.ke/api/v1/bill/pdf/V5DL5H35BQ_Homa%20Bay-%20003-2023_Homabay%20County%20Fisheries%20and%20Aquaculture%20Management%20Bill%202023.pdf
- [CGoM] County Government of Migori. 2023. County Integrated Development Plan: 2023–2027. <https://migori.go.ke/wp-content/uploads/2023/08/County-Integrated-Development-Plan-FY-2023-2027.pdf>
- Cuaton GP. 2019. A post-disaster gendered value chain analysis on seaweed farming after Super Typhoon Haiyan in the Philippines. *Journal of Enterprising Communities: People and Places in the Global Economy* 13(4):508–524. <https://doi.org/10.1108/JEC-11-2018-0091>
- [EAC] East African Community. 2018. Fisheries and Aquaculture Policy for the East African Community. <https://lvfo.org/sites/default/files/field/Fisheries%20and%20Aquaculture%20Policy%20for%20EAC%2012th%20April%202018.pdf>
- [EAC] East African Community. 2011. East African Community Climate Change Policy Framework. <https://www.eac.int/environment/climate-change/eac-climate-change-policy-framework>
- [FAO] Food and Agriculture Organization of the United Nations. 2023. *The status of women in agrifood systems*. Rome: FAO. <https://doi.org/10.4060/cc5343en>
- [FAO] Food and Agriculture Organization of the United Nations. (2018). *The state of world fisheries and aquaculture 2018: Meeting the Sustainable Development Goals*. Rome: FAO. <https://www.fao.org/documents/card/en?details=I9540EN>
- [GoK] Government of Kenya. 2022. Economic Survey Report 2022. In Economic Survey 2022. Nairobi: Kenya National Bureau of Statistics (KNBS).
- [GoK] Government of Kenya. 2007. Fisheries (Beach Management Units) Act. Nairobi: Government Printer <https://faolex.fao.org/docs/pdf/ken101510.pdf>
- [GoK] Government of Kenya. 2016a. Fisheries (Management and Development) Act. Nairobi: Government Printer <https://kilimo.go.ke/wp-content/uploads/2022/03/Marine-Access-Regulations-18032022.pdf>
- [GoK] Government of Kenya. 2016b. Kenya National Adaptation Plan: 2015–2030. https://www4.unfccc.int/sites/NAPC/Documents%20NAP/Kenya_NAP_Final.pdf

- [GoK] Government of Kenya. 2016c. Migori County Fisheries and Aquaculture. Migori County Gazette Supplement No.4 (Acts No.2). <https://www.fao.org/faolex/results/details/en/c/LEX-FAOC185005/>
- [GoK] Government of Kenya. 2019. National policy on gender and development: Towards creating a just, fair and transformed society free from gender-based discrimination in all spheres of life practices. <https://psyg.go.ke/wp-content/uploads/2019/12/NATIONAL-POLICY-ON-GENDER-AND-DEVELOPMENT.pdf>
- [GoK] Government of Kenya. 2021a. Migori County Climate Change. Kenya Gazette Supplement No. 8 (Migori County Acts No. 3). https://www.slo-countybills.go.ke/api/v1/bill/files/1Q2VH8GCTE_MIGORI_ACT-32021_THE%20%20MIGORI%20COUNTY%20CLIMATE%20CHANGE%20ACT,%202021.pdf
- [GoK] Government of Kenya. 2021b. Migori County Climate Change Fund. Kenya Gazette Supplement No. 7 (Migori County Acts No. 2) https://www.slo-countybills.go.ke/api/v1/bill/files/H9715OPAGD_MIGORI-ACT-2-2021_THE%20MIGORI%20COUNTY%20CLIMATE%20CHANGE%20FUND%20ACT,%202021.pdf
- [GOK] Government of Kenya. 2023. The Fisheries Management and Development Bill (2023) <http://www.parliament.go.ke/sites/default/files/2023-07/THE%20FISHERIES%20MANAGEMENT%20AND%20DEVELOPMENT%20BILL%2C%202023-1.pdf>
- Hanich Q, Wabnitz CC, Ota Y, Amos M, Donato-Hunt C and Hunt A. 2018. Small-scale fisheries under climate change in the Pacific Islands region. *Marine Policy* 88:279–284. <https://doi.org/10.1016/j.marpol.2017.11.011>
- Hoegh-Guldberg O and Northrop E, eds. 2019. The ocean as a solution to climate change: Five opportunities for action. Report. Washington, DC: World Resources Institute. <https://oceanpanel.org/publication/the-ocean-as-a-solution-to-climate-change-five-opportunities-for-action/>
- Hossain PR, Amjath-Babu TS, Krupnik TJ, Braun M, Mohammed EY, and Phillip M. 2021. Developing climate information services for aquaculture in Bangladesh: A decision framework for managing temperature and rainfall variability-induced risks. *Frontiers in Sustainable Food Systems* Vol 5. <https://doi.org/10.3389/fsufs.2021.677069>
- Hossain PR, Ludwig F and Leemans R. (2018). Adaptation pathways to cope with salinization in south-west coastal region of Bangladesh. *Ecology and Society* 23(3). <https://www.jstor.org/stable/26799149>
- [IUCN] International Union for Conservation of Nature. 2019. Advancing gender in the environment: Gender in fisheries—A sea of opportunities. Washington, DC: USAID and IUCN. <https://portals.iucn.org/library/sites/library/files/documents/2019-040-En.pdf>
- Kleiber D, Harper S, Appiah S, Atkins M, Bradford K, Choudhury A, Cohen P, de la Puente S, De la Torre Castro M, Duffy-Tumas A et al. In press b. Gender and small-scale fisheries: Moving beyond sexist data structures. In *FAO, Duke University and WorldFish. Illuminating hidden harvests: The contribution of small-scale fisheries to sustainable development*. Rome: FAO.
- Kleiber D, Frangoudes K, Snyder HT, Choudhury A, Cole SM, Soejima K, Pita C, Santos A, McDougall C, Petrics H et al. (2017). Promoting gender equity and equality through the Small-Scale Fisheries Guidelines: Experiences from multiple case studies. In Jentoft S, Chuenpagdee R, Barragán-Paladines M and Franz N, eds. *The Small-Scale Fisheries Guidelines*. MARE Publication Series, vol 14. Springer, Amsterdam, Netherlands: University of Amsterdam and Wageningen University. doi: 10.1007/978-3-319-55074-9_35.
- Kolding J, Zwieten PV, Mkumbo O, Silsbe G and Hecky R. 2008. Are the Lake Victoria fisheries threatened by exploitation or eutrophication? Towards an ecosystem-based approach to management. In *The ecosystem approach to fisheries* (pp. 309–350). Wallingford, UK: CABI.
- Lawless S, Cohen P, McDougall C, Orirana G, Siota F and Doyle K. 2019. Gender norms and relations: Implications for agency in coastal livelihoods. *Maritime Studies* 18(3)347–358. <https://doi.org/10.1007/s40152-019-00147-0>
- Lau JD, Kleiber D, Lawless S and Cohen PJ. 2021. Gender equality in climate policy and practice hindered by assumptions. *Nature Climate Change* (11):186–92. <https://www.nature.com/articles/s41558-021-00999-7>.

- Manyungwa CL, Hara MM and Chimatiro SK. 2019. Women's engagement in and outcomes from small-scale fisheries value chains in Malawi: Effects of social relations. *Maritime Studies* 18:275–285. <https://doi.org/10.1007/s40152-019-00156-z>
- Lung'Ayia HB, M'harzi A, Tackx M, Gichuki J and Symoens, JJ. 2000. Phytoplankton community structure and environment in the Kenyan waters of Lake Victoria. *Freshwater Biology* 43(4) 529–543.
- Moser C. 2015. Listening to women fishers on the Sekong River: Fostering resilience in village fishery co-management. *The Journal of Lao Studies* 140–160. <https://www.laostudies.org/sites/default/files/public/11%20Moser.pdf>
- Munguti J, Obiero K, Orina P, Mirera D, Kyule D, Mwaluma J, Opiyo M, Musa S, Ochiewo J, Njiru J et al. 2021. State of Aquaculture Report 2021: Towards Nutrition Sensitive Fish Food Production Systems. Techplus Media House, Nairobi, Kenya, 190.
- Mugidde R, Gichuki J, Rutagemwa D, Ndawula L and Matovu A. 2005. Status of water quality and its implication on fishery production. <https://aquadocs.org/handle/1834/7202>
- Nunan F and Cepić D. 2020. Women and fisheries co-management: Limits to participation on Lake Victoria. *Fisheries Research* 224:105454. <https://doi.org/10.1016/j.fishres.2019.105454>
- Obiero KO, Abila RO, Njiru MJ, Raburu PO, Achieng AO, Kundu R and Lawrence T. 2015. The challenges of management: Recent experiences in implementing fisheries co-management in Lake Victoria, Kenya. *Lakes & Reservoirs: Research & Management* 20(3):139–154. <https://doi.org/10.1111/lre.12095>
- Ottinger M, Clauss K and Kuenzer C. 2016. Aquaculture: relevance, distribution, impacts and spatial assessments—A review. *Ocean and Coastal Management* 119:244–266 <https://doi.org/10.1016/j.ocecoaman.2015.10.015>
- Rohe J, Schlüter A and Ferse SCA. 2018. A gender lens on women's harvesting activities and interactions with local marine governance in a South Pacific fishing community. *Maritime Studies* 17(2):155–162. <https://doi.org/10.1007/s40152-018-0106-8>
- Thomas AS, Mangubhai S, Vandervord C, Fox M and Nand Y. 2019. Impact of Tropical Cyclone Winston on women mud crab fishers in Fiji. *Climate and Development* 11(8):699–709. <https://doi.org/10.1080/17565529.2018.1547677>
- Thorpe A, Pouw N, Baio A, Sandi R., Ndomahina ET and Lebbie T. 2014. "Fishing na everybody business": Women's work and gender relations in Sierra Leone's fisheries. *Feminist Economics* 20(3):53–77. <https://doi.org/10.1080/13545701.2014.895403>
- Treviño M and Murillo-Sandoval PJ. 2021. Uneven consequences: Gendered impacts of shrimp aquaculture development on mangrove dependent communities. *Ocean and Coastal Management* 210: 105688. <https://doi.org/10.1016/j.ocecoaman.2021.105688>
- Weston M. 2015. Troubled waters: Why Africa's largest lake is in grave danger. http://www.slate.com/articles/news_and_politics/roads/2015/03/lake_victoria_is_in_grave_danger_africa_s_largest_lake_is_threatened_by.html

Acknowledgments

This discussion brief was prepared by WorldFish in collaboration with Stockholm Environment Institute (SEI)-Africa Center. The brief is published by the Ukama Ustawi: Diversification for Resilient Agribusiness Ecosystems in East and Southern Africa (ESA) initiative, led by the International Water Management Institute (IWMI) and other CGIAR institutions, including WorldFish. Ukama Ustawi's ESA initiative conducts multidisciplinary research for development. The initiative promotes research innovations that enhance the contribution of smallholder farmers and of agricultural entrepreneurs (women, men, and youth) in reducing poverty and in increasing food and nutrition security, thus promoting healthier diets and improving natural systems. We also thank the CGIAR initiative on Aquatic Foods for providing us with the platform to conduct this study. This work was also carried out under the CGIAR GENDER Impact Platform, which is grateful for the support of CGIAR Trust Fund contributors: www.cgiar.org/funders.

This is a contribution to the following:



Citation

This publication should be cited as: Adam, R., Ouko, K., Osano, P., Amwata, D., and Ndiema, N. (2024). Examining the impacts of climate change on the livelihoods of fisher communities in the Lake Victoria Zone Region through a gender lens. Discussion Brief, Penang, Malaysia.

Authors affiliation

Dr. Rahma Adam and Dr. Kevin Ouko, WorldFish.

Dr. Philip Osano, Stockholm Environment Institute-Africa Center.

Prof. Dorothy Amwata, Murang'a University of Technology.

Nicholas Ndiema, Independent Consultant.

Creative Commons License



Content in this publication is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0), which permits non-commercial use, including reproduction, adaptation and distribution of the publication provided the original work is properly cited.

© 2024 Ukama Ustawi: Diversification for Resilient Agribusiness Ecosystems for East and Southern Africa, CGIAR GENDER Impact Platform and Aquatic Foods initiative.