



Climate change, gender and aquatic food systems: call for action to address gender and social inequalities matters in the nexus

Introduction

Aquatic foods—harvested and grown in water—are vital for global food security, poverty alleviation and economic development. But they are increasingly under threat from temperature rise, ocean acidification and extreme climate (Mohammed et al. 2021).

By 2100, under a high-emissions, no-mitigation scenario, aquatic food systems worldwide are projected to face climate threat. But low-income countries in Africa, South and Southeast Asia and the Indo-Pacific will experience the highest risks on nutrition and health, social equity and economic and environmental sustainability (Tigchelaar et al. 2021; Lam et al. 2016). In contrast, aquatic food systems of more developed countries—which are among the highest emitters of greenhouse gas emissions—are predicted to experience low to medium climate risk (Tigchelaar et al. 2021).

The uneven distribution of the adverse impacts of climate change on aquatic food systems is not only being felt between countries, but also within them. Particularly hard-hit are people who already experience intersecting power inequalities due to gender, socioeconomic class, age, location, ethnicity, ability, religion and caste. Among poor and marginalized groups, women are especially vulnerable to climate change due to their over-dependence on natural resources (Benansio et al. 2022; Hope 2009). They have limited coping and adaptive capacity owing to their multiple, competing responsibilities, further exacerbated by power inequalities (Salgueiro-Otero et al. 2022; Cinner and Barnes 2019; Mortreux and Barnett, 2017).

Therefore, research on the resilience of aquatic food systems to climate change must take gender and intersectional dimensions into account. Quantitative and qualitative research must **transcend the household-level and gender-binary (men-women) focus** to explore adaptation strategies of actors in small-scale fisheries and aquaculture chains. In addition, to address entrenched power inequalities at formal, informal, local and systemic levels, it is imperative that there be **more collaboration across research, interventions and policies** on climate adaptation and mitigation, and on aquatic food systems. A collaborative agenda premised on the diversity inherent in small-scale fisheries and aquaculture has the potential to build resilient, equitable, efficient and effective aquatic food systems.

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Conceptual framework

To guide our analysis (see Figure 1), we developed a conceptual framework based on the gendered food systems framework (Njuki et al. 2021). We also integrated a component from a predictive model of risk analysis in aquatic food systems (Tigchelaar et al. 2021).

In this framework, **climate shocks and stresses** interact with **aquatic food systems and their drivers** leading to **different country-specific risk outcomes**. Within countries, the risk to aquatic food system outcomes (health and nutrition, social cohesion and wellbeing, gender equality and empowerment, economic and livelihood and environment) is different for diverse groups of women and men. This difference is determined by the magnitude of gendered and intersectional inequality at formal or informal, and at individual or systemic levels.

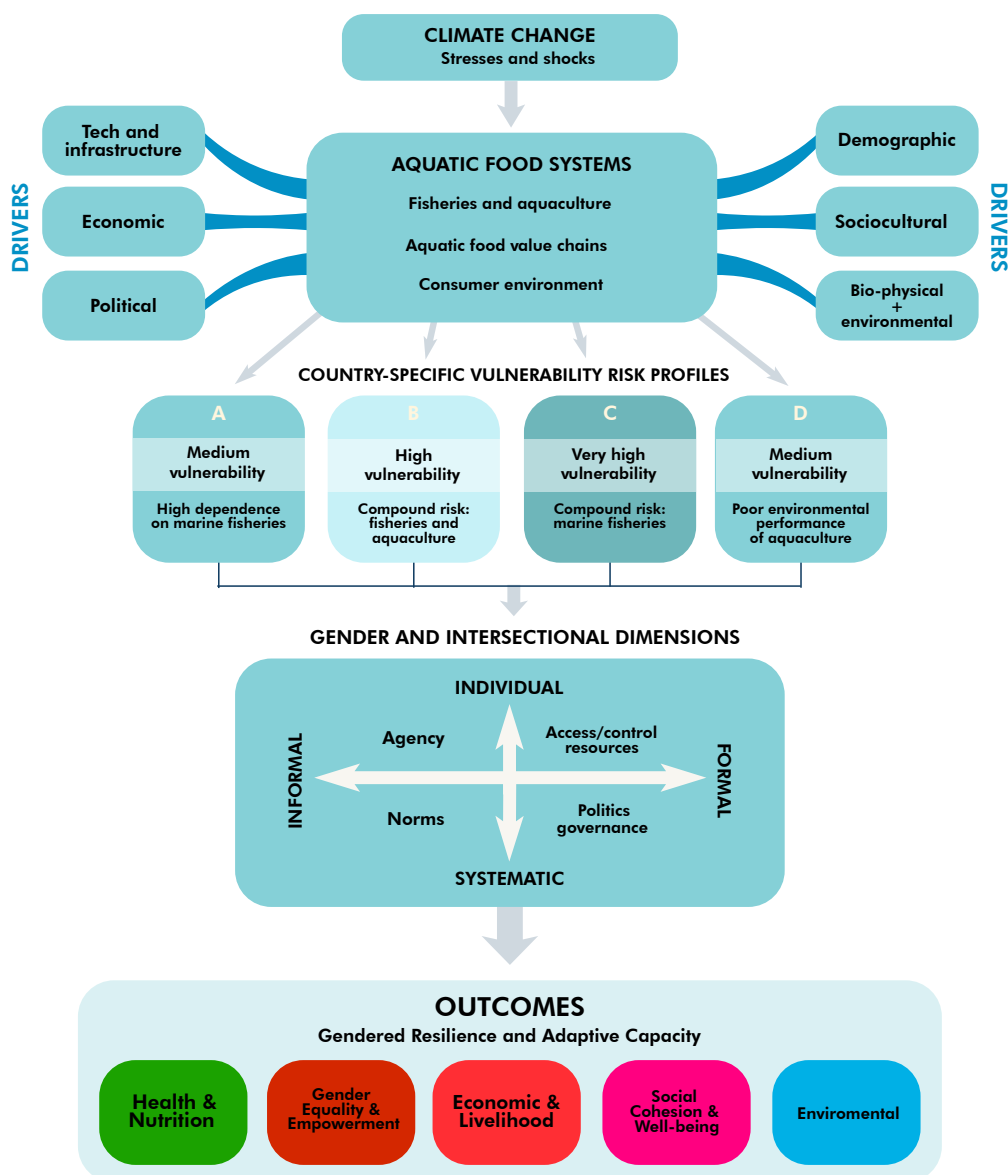


Figure 1. Gendered resilience and adaptive capacity of aquatic food systems

Methodology

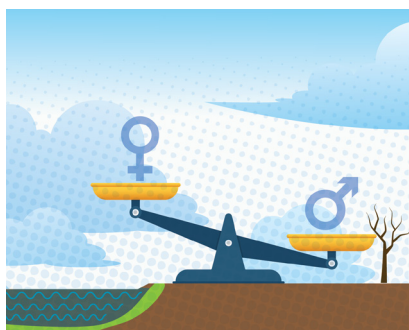
To validate this conceptual framework and to identify research gaps, we conducted a systematic review of the empirical literature in the 2017–2022 period. This yielded 62 relevant articles. A complementary analysis was also conducted on the publicly available Bangladesh Integrated Household Survey (BIHS), and the 2019 Illuminating Hidden Harvests data. BIHS has a representative dataset of women and men aquaculture farmers in Bangladesh from 2018 to 2019.

Main findings



Invisibility of women is endemic within aquatic food systems, in scientific literature, fisheries and aquaculture statistics, monitoring and evaluation systems, and fisheries policies (Kleiber et al. In press; Ahmed et al. 2022; Gonzalez Parrao et al. 2021)

The gender gaps in these areas negatively reinforce each other. They often also lead to gender-blind interventions and policies that undermine the resilience of aquatic food systems to climate change and other shocks. Additionally, for the most vulnerable populations, these gaps exacerbate pre-existing gender inequalities and poverty. For example, in a post-disaster relocation program in Fiji, and despite “participatory consultation”, government agencies were insensitive to local cultural norms. This reduced women to passive observers, left out of decisions on house design and location (Bertana and Blanton 2022). It adversely affected their fishing and gleaning, which enhance household diet and nutrition. Women were left more dependent on men’s farming.



Gender and intersectional inequalities within formal and informal, and individual and systemic dimensions, are key determinants of aquatic food systems actor responses to climate shocks and stresses

There is overwhelming evidence of the varying constraints faced by women and men from different geographic, sociocultural and economic contexts in fisheries and aquaculture in diversifying their livelihoods, driven by climate shocks and stresses. The evidence illuminates how gender and other socioeconomic variables combine to compromise the ability of women and men to participate and benefit from interventions for climate adaptation and mitigation. For some women, polygamy in certain African contexts can limit their control over fish-trading income (Manyungwa et al. 2019). Location, language barriers and socio-religious norms also curtail access to disaster-warning and climate services for certain groups of women (Ahmed et al. 2022; Gumucio et al. 2022).

Our analysis of the 2019 BIHS dataset shows that women aquaculture farmers have reduced access to information, credit and productive capital for climate-change resilience and adaptation (see Figure 2). Several indicators also suggest that women might be underrepresented in community decision-making. For example, there are significantly fewer women leading producer and water-user groups. Few women are at ease speaking in public in discussions.

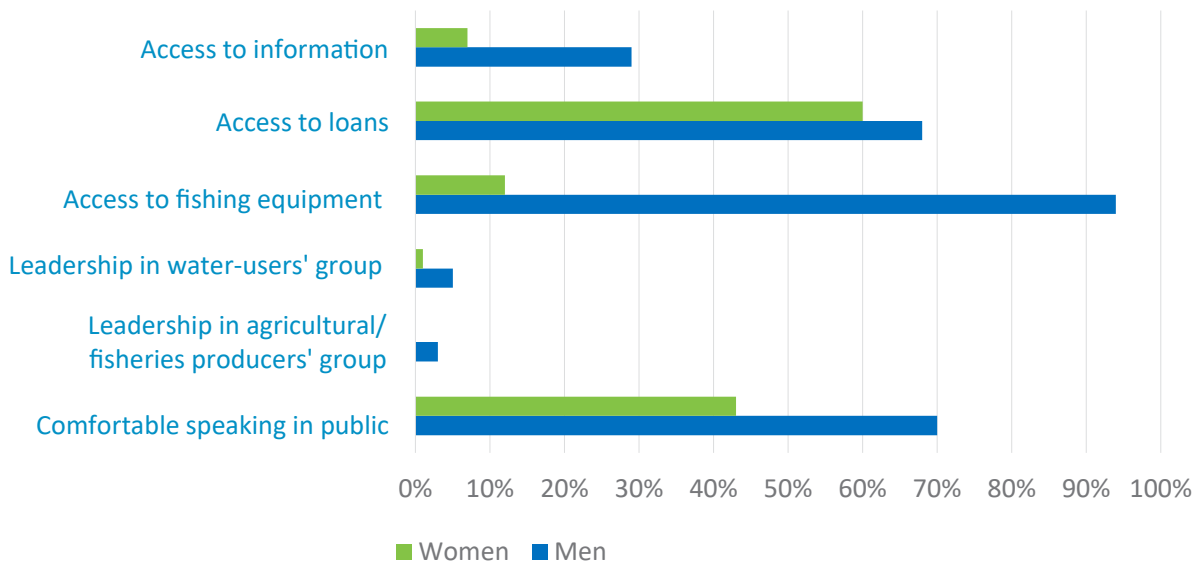
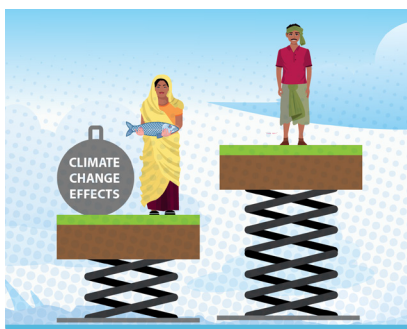


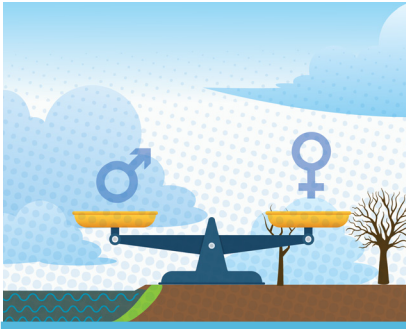
Figure 2. Differences in determinants of adaptive capacity between women and men aquaculture farmers in Bangladesh (2019)



Climate change aggravates pre-existing gender and intersectional inequalities, pushing the most marginalized into short-term coping strategies that undermine household, community and ecosystem health and wellbeing

Those already without agency and without access to resources are often the hardest hit by losses in livelihoods and income. Short-term coping strategies adopted by poor fishing-dependent households where men migrate is creating a **feminization of small-scale fisheries**. These by-default female-headed households face increasing poverty, mental stress, and poor nutrition and health (Ahmed et al. 2022, Deb and Haque 2017). The situation not only erodes the health and wellbeing of women but also compromises inter-generational resilience, given the negative impact on children (Harper et al.2017).

Increasing competition for food and income in overexploited coastal and marine resources intensifies conflicts between users, and increases gender-based violence. It also exacerbates the degradation of fragile marine ecosystems (Andriessse et al. 2021; Manyungwa et al. 2019; Castañeda et al. 2020; Mozumder et al. 2018).



Aquatic food systems interventions and policies that address gender and power inequalities at individual, systemic, informal and formal dimensions are more sustainable, and improve economic and social resilience of vulnerable groups

The literature review showed how improving women's access to affordable and accessible credit and labor-saving, post-harvest technologies boosted incomes and intra-household decision-making of women fish traders in Kenya and Malawi (Manyungwa et al. 2019; Mokuia et al. 2020).

In Myanmar and Vietnam, training for both men and women in joint decision-making for aquaculture transformed gender relations and boosted farm technical efficiency and productivity (Aung et al. 2021; Bosma et al. 2019).

In Ghana and Mexico, co-management of fragile coastal and marine ecosystems that involved poor women and men as fish farmers and co-researchers, rather than as "wives of fish farmers" "beneficiaries" or "research subjects" was more effective, resource-efficient and equitable than classical top-down approaches. The resultant, locally owned governance was more sustainable (Atindana et al. 2019; Quintana et al. 2020).



Recommendations



1. Policy, research and interventions for sustainable and resilient aquatic food systems must collaboratively address multi-level power inequalities (informal, formal, individual and systemic)



Research and interventions: engage both women and men to complement gains in income, food security and livelihood diversification with increased decision-making power for women on resource allocation and on income. Household-based approaches that involve men and women redress unequal division of household labor, and enable innovations that reduce the tedium, labor and time spent on domestic tasks.



Institutional: commit resources and funding for gender sensitization at community level, and in state and research agencies. This can help to reduce gender inequality in staffing and pay, and change attitudes and practices that curtail women's mobility and active participation in public forums.



Policy: climate-adaptation policy must be informed by women's contribution to small-scale and subsistence fisheries, the different needs of men and women, and the specific constraints they experience (due to socio-religious norms, access to resources and labor, and time constraints). Mitigation strategies must be gender-responsive: this includes balancing the increasing involvement of marginalized women and men in livelihood diversification with adequate financial compensation, and labor-saving and productivity-enhancing technologies.



2. Women's work within the aquatic foods value chain must be recognized, documented and its contribution valued



Intervention/project: integrating gender and intersectionality within the theory of change, and sex-disaggregated data in monitoring, evaluation and learning.



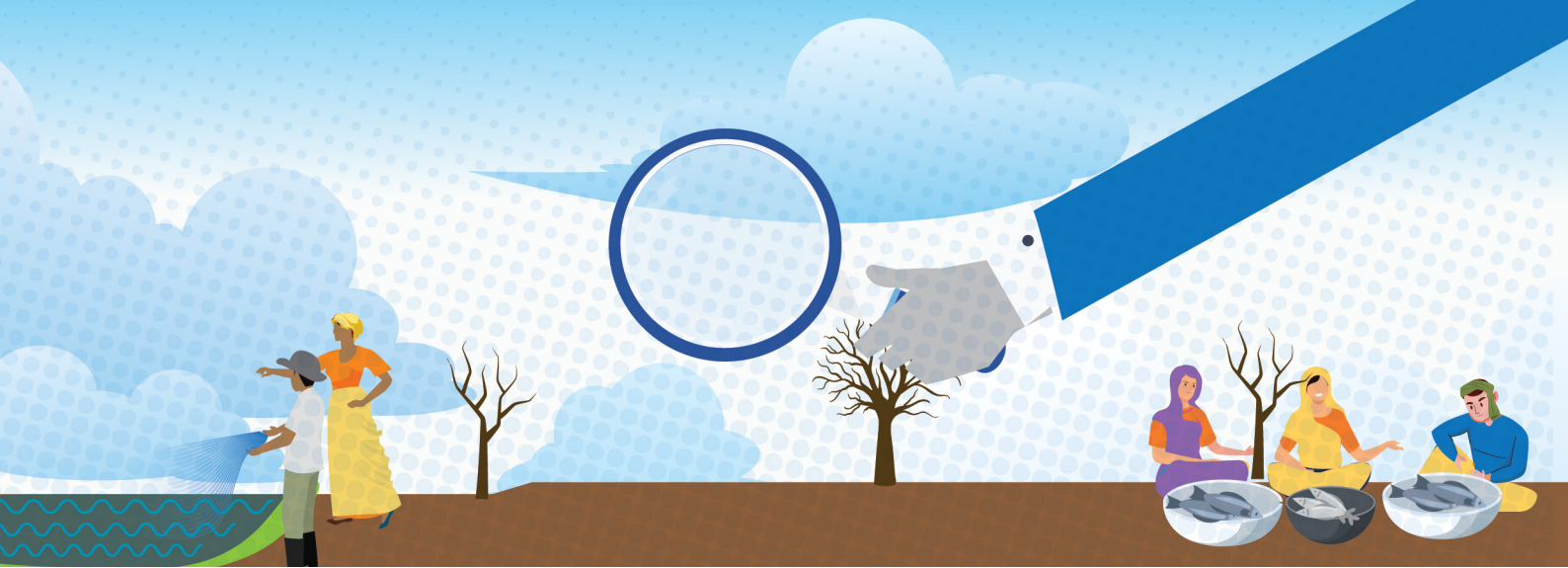
Research: quantify qualitative insights on women's work across the fisheries and aquaculture value chain (pre-production, postharvest processing and trade). Quantify women's contribution to subsistence fisheries, and in the informal market—a contribution which is often overlooked.



Policy: earmark funding and resources to systematically collect quantitative data on women's contributions in the aquatic food value chains, in order to formulate evidence-based, gender-responsive policies that recognize and utilize the agency and knowledge of marginalized actors. This enables more sustainable and custodial management of aquatic food resources.

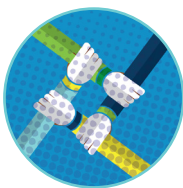


Resources and ecosystems: with shared responsibility, clear roles and local ownership. Beyond formulation, ensure policy implementation and enforcement, and gender-sensitive budgeting in aquatic food systems.

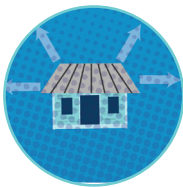


3. Research on climate change and small-scale fisheries and aquaculture—with a gender and intersectional lens—is critically needed to determine the heterogeneity and agency in the adaptive capacity of local actors

This opens avenues for interventions and policy that integrates local actors as part of the solution—rather than the problem—thus bolstering sustainable, equitable and resilient aquatic food systems. Specific focus on:



Closer interdisciplinary engagement between socioecological resilience analysis and gender analysis in research on climate change and aquatic food systems. This should combine the ongoing effort to increase and improve sex-disaggregated data in small-scale fisheries and aquaculture systems research with developing high-quality gender analysis on socioecological dynamics in small-scale fisheries (Kawarazuka et al. 2017).



Going beyond a household- and gender-binary focus in qualitative and quantitative research for a better understanding of climate change-driven adaptive choices by women and men on livelihood diversification in different contexts (agroecology, age, class, caste, ethnicity, household headship).

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