



Changing Tides: How Climate Change Threatens the Livelihoods of Fisherwomen in Bali

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Abstract

This research examines the disproportionate impacts of climate change on the livelihoods of fisherwomen in Bali, Indonesia, a region where coastal communities are deeply reliant on marine resources. As global warming accelerates, rising sea levels, ocean acidification, and shifting fish stocks are undermining the stability of fisheries, which in turn affects the socio-economic well-being of small-scale, artisanal fishers. While the broader discourse on climate change often focuses on male-dominated sectors such as agriculture and fishing, the specific challenges faced by women in the fishing industry remain largely underexplored. This study highlights how fisherwomen, who are involved in both the capture and post-capture processes (e.g., fish processing, marketing, and trade), are facing increased economic insecurity, as well as social marginalization, due to the decline in fish populations and the degradation of marine ecosystems. Drawing on interviews with fisherwomen, community leaders, and environmental experts, this research underscores the intersection of gender, economic vulnerability, and climate change. The findings reveal that while women in these communities possess vital knowledge and adaptive capacities, they are often excluded from decision-making processes regarding resource management and climate adaptation strategies. The study argues for the inclusion of gender-sensitive approaches in climate policies and sustainable fisheries management to ensure that the voices and needs of fisherwomen are addressed. This research contributes to the broader field of climate justice by highlighting the critical role of gender in shaping vulnerability and resilience in the face of climate change.



[Penelitian ini mengkaji dampak yang tidak proporsional dari perubahan iklim terhadap mata pencaharian perempuan nelayan di Bali, Indonesia, sebuah wilayah di mana masyarakat pesisir sangat bergantung pada sumber daya laut. Seiring percepatan pemanasan global, kenaikan permukaan laut, pengasaman laut, dan pergeseran stok ikan mengancam stabilitas perikanan, yang pada gilirannya memengaruhi kesejahteraan sosial-ekonomi nelayan skala kecil dan tradisional. Meskipun wacana yang lebih luas tentang perubahan iklim sering berfokus pada sektor yang didominasi laki-laki seperti pertanian dan perikanan, tantangan spesifik yang dihadapi perempuan dalam industri perikanan sebagian besar masih kurang dieksplorasi. Studi ini menyoroti bagaimana perempuan nelayan, yang terlibat dalam proses penangkapan dan pasca-penangkapan (misalnya, pengolahan ikan, pemasaran, dan perdagangan), menghadapi peningkatan ketidakamanan ekonomi, serta marginalisasi sosial, karena penurunan populasi ikan dan degradasi ekosistem laut. Berdasarkan wawancara dengan perempuan nelayan, pemimpin masyarakat, dan pakar lingkungan, penelitian ini menggarisbawahi keterkaitan antara gender, kerentanan ekonomi, dan perubahan iklim. Temuan penelitian ini mengungkapkan bahwa meskipun perempuan di komunitas-komunitas ini memiliki pengetahuan penting dan kapasitas adaptif, mereka seringkali dikecualikan dari proses pengambilan keputusan terkait pengelolaan sumber daya dan strategi adaptasi iklim. Studi ini menganjurkan dimasukkannya pendekatan yang peka gender dalam kebijakan iklim dan pengelolaan perikanan berkelanjutan untuk memastikan bahwa suara dan kebutuhan perempuan nelayan diperhatikan. Penelitian ini berkontribusi pada bidang keadilan iklim yang lebih luas dengan menyoroti peran penting gender dalam membentuk kerentanan dan ketahanan dalam menghadapi perubahan iklim.]

Keywords: Climate Change, Fisherwomen, Livelihoods, Climate Justice, Bali

Introduction

A. Background and Context

Climate change has emerged as one of the most significant environmental and socio-economic challenges of the twenty-first century, profoundly affecting coastal and marine ecosystems that support millions of livelihoods worldwide. Rising sea surface temperatures, increasing ocean acidification, sea-level rise, and the growing frequency of extreme weather events have altered marine biodiversity, disrupted fish migration patterns, and reduced the productivity of fisheries upon which coastal communities depend (Intergovernmental Panel on Climate Change [IPCC], 2023). These environmental transformations are particularly consequential for small-scale fisheries, which provide food security, employment, and cultural identity for approximately 500 million people globally

(Food and Agriculture Organization [FAO], 2024). Unlike industrial fisheries, small-scale fishing communities often possess limited financial resources, inadequate technological capacity, and restricted institutional support, making them especially vulnerable to climate-induced environmental changes.

Indonesia, the world's largest archipelagic nation, is among the countries most exposed to the impacts of climate change on marine resources. With more than 17,000 islands and one of the world's richest marine biodiversity hotspots, the country's coastal economy relies heavily on fisheries and marine-based livelihoods. The fisheries sector contributes substantially to national food security and local economic development while supporting millions of households engaged in fishing, fish processing, and seafood marketing (FAO, 2024). However, increasing sea temperatures, unpredictable monsoon patterns, coastal erosion, coral reef degradation, and changing ocean currents have significantly affected fish availability and fishing productivity across many Indonesian coastal regions (IPCC, 2023). These environmental changes have generated growing uncertainty for households whose livelihoods depend directly or indirectly on marine ecosystems.

Among Indonesia's coastal regions, Bali presents a particularly important case for examining the relationship between climate change and fisheries livelihoods. Although internationally recognized as a global tourism destination, Bali maintains vibrant coastal communities whose economies continue to depend on artisanal fisheries, aquaculture, and marine-related activities. Small-scale fisheries remain integral to local livelihoods, cultural traditions, and food systems, particularly in coastal villages where fishing represents both an economic activity and a social institution. Nevertheless, climate variability has increasingly affected fish catches, shortened fishing seasons, and heightened risks associated with marine activities. Stronger waves, changing wind patterns, and unpredictable weather conditions have reduced fishing opportunities while increasing operational costs and occupational hazards for fishing households.

The consequences of these environmental changes extend well beyond fishermen who harvest marine resources. Coastal livelihoods are sustained through interconnected value chains involving fish processing, preservation, transportation, marketing, and household resource management, activities in which women play indispensable roles. Fisherwomen contribute significantly to maintaining household incomes by processing fish products, managing seafood trade, supporting financial planning, and engaging in alternative livelihood activities during periods of low fish production. Despite these contributions, their economic roles frequently remain invisible within fisheries statistics, development planning, and public policy, which traditionally conceptualize fisheries as a male-dominated sector (Harper et al., 2020).

The invisibility of women's labour has important implications for understanding climate vulnerability. Climate-induced declines in fish catches directly reduce the availability of raw materials for processing and marketing activities commonly undertaken by women. Simultaneously, household economic instability often increases women's unpaid care responsibilities as they seek additional income sources while continuing domestic work. Consequently, climate change does not merely threaten marine ecosystems; it reshapes gender relations, labour allocation, and household resilience within fishing communities (Bennett et al., 2021). Existing adaptation policies frequently prioritize fishing technology, vessel modernization, or ecosystem conservation while paying comparatively limited attention to the socio-economic challenges experienced by women throughout fisheries value chains.

Recent scholarship increasingly recognizes that vulnerability to climate change is socially differentiated rather than environmentally determined alone. Factors such as gender, income, education, access to assets, political participation, and social capital influence how individuals experience environmental risks and their capacity to adapt (Eriksen et al., 2021). Women in coastal communities often encounter multiple structural constraints, including unequal access to productive resources, limited ownership of fishing assets, lower participation in decision-making institutions, and reduced access to climate information, financial services, and adaptation programs. These inequalities amplify climate risks and constrain opportunities for livelihood diversification, thereby increasing socio-economic vulnerability.

Accordingly, understanding climate impacts on fisheries requires moving beyond ecological assessments toward integrated analyses that consider social inequalities, gender relations, and institutional arrangements. Examining climate change solely through environmental indicators risks overlooking the differentiated experiences of individuals within fishing households and may result in adaptation policies that inadvertently reinforce existing inequalities. A gender-sensitive perspective therefore offers a more comprehensive understanding of how environmental change interacts with social structures to influence livelihood security and community resilience.

B. Fisherwomen and Climate Justice

The concept of climate justice has gained increasing prominence in climate governance by emphasizing that the consequences of climate change are distributed unevenly across societies. Rather than affecting all populations equally, climate impacts disproportionately burden individuals and communities with fewer economic resources, weaker political influence, and historically marginalized social positions (Schlosberg & Collins, 2014). Climate justice therefore extends beyond environmental protection by addressing questions of

equity, recognition, participation, and responsibility within climate adaptation and development policies.

Within fisheries, climate justice is particularly relevant because women frequently occupy positions that are economically essential yet institutionally overlooked. Across many coastal communities, fisherwomen participate extensively in post-harvest fisheries, including fish cleaning, drying, smoking, processing, packaging, transportation, retail marketing, bookkeeping, and household financial management. These activities generate substantial economic value while stabilizing household incomes during periods of fluctuating fish production (Harper et al., 2020). Nevertheless, fisheries governance often defines fishers narrowly as individuals directly engaged in harvesting marine resources, resulting in the exclusion of women from fisheries statistics, social protection schemes, capacity-building programs, and policy consultations.

Recognition represents a fundamental dimension of climate justice because public policies cannot effectively address the needs of groups whose contributions remain socially invisible. Failure to recognize women's roles in fisheries leads to adaptation interventions that overlook gender-specific vulnerabilities and capacities. For example, financial assistance targeting fishing equipment may primarily benefit male fishers, whereas women engaged in fish processing and marketing may require access to credit, storage facilities, market infrastructure, or business training. Without adequate recognition, adaptation policies risk reproducing structural inequalities rather than reducing vulnerability.

Participation constitutes another essential principle of climate justice. Inclusive governance requires that all stakeholders affected by environmental change have meaningful opportunities to influence decision-making processes. However, women in many fishing communities continue to experience limited representation within fisheries cooperatives, village institutions, resource management committees, and climate adaptation forums (Bennett et al., 2021). Social norms, gendered divisions of labour, and institutional barriers often constrain women's voices despite their extensive knowledge of household economies and local marine conditions.

Moreover, fisherwomen possess valuable forms of local ecological knowledge developed through daily interactions with fisheries value chains and coastal environments. Their observations regarding changes in fish quality, seasonal availability, processing conditions, market demand, and household consumption patterns provide important insights into community adaptation strategies. Integrating these perspectives into fisheries governance can strengthen adaptive capacity while enhancing the legitimacy and effectiveness of climate policies.

Adopting a climate justice perspective therefore shifts analytical attention from environmental impacts alone toward broader questions concerning whose livelihoods are protected, whose knowledge is recognized, and whose voices

shape adaptation decisions. Such an approach is particularly important in Bali, where tourism development, environmental change, and traditional fisheries intersect to create complex socio-economic dynamics affecting women and men differently.

C. Research Objectives and Questions

Despite growing international attention to gender-responsive climate adaptation, empirical evidence regarding the experiences of fisherwomen in Indonesia remains limited. Existing studies predominantly examine ecological changes, fisheries management, or fishermen's adaptive strategies, while comparatively few investigate how climate change influences women's livelihoods across fisheries value chains. Consequently, important questions remain regarding the gendered distribution of climate risks, the adaptive capacities developed by fisherwomen, and the inclusiveness of fisheries governance in addressing their needs.

This study seeks to address these gaps by examining how climate change affects the livelihoods of fisherwomen in Bali through the analytical lens of climate justice. Specifically, the study pursues three objectives. First, it investigates the ways in which climate-induced environmental changes influence women's economic activities, household responsibilities, and livelihood security within coastal fishing communities. Second, it analyses the gender-specific vulnerabilities and adaptive capacities that shape fisherwomen's responses to changing environmental conditions. Third, it evaluates the extent to which existing fisheries governance and climate adaptation policies recognize, include, and support fisherwomen as key stakeholders in sustainable coastal development.

Guided by these objectives, the study addresses the following research questions:

1. How does climate change affect the livelihoods of fisherwomen in coastal communities in Bali?
2. What gender-specific vulnerabilities and adaptive capacities characterize fisherwomen's responses to climate-related environmental change?
3. To what extent do existing fisheries and climate adaptation policies incorporate principles of climate justice through the recognition and participation of fisherwomen?

By addressing these questions, the study contributes to the growing literature on gender, climate change, and small-scale fisheries while providing empirical evidence to support more inclusive and equitable climate adaptation policies in Indonesia's coastal regions.

Literature Review

A. Climate Change and Coastal Fisheries

Climate change has become one of the most significant drivers of ecological transformation in marine environments, profoundly affecting the sustainability of coastal fisheries worldwide. Scientific evidence demonstrates that increasing sea surface temperatures, ocean acidification, altered ocean circulation, sea-level rise, and the growing frequency of extreme weather events have changed marine ecosystem dynamics, resulting in shifts in fish distribution, species composition, reproductive cycles, and fisheries productivity (IPCC, 2023). These environmental changes threaten both marine biodiversity and the socio-economic stability of coastal communities whose livelihoods depend directly on fisheries resources.

Small-scale fisheries are particularly vulnerable because they depend heavily on local ecological conditions and possess limited adaptive capacity compared with industrial fisheries. Fishers operating with traditional vessels and simple fishing technologies often lack access to climate information, financial capital, insurance mechanisms, and modern equipment that could reduce exposure to climate risks (FAO, 2024). Consequently, fluctuations in fish abundance, unpredictable fishing seasons, and increasingly hazardous sea conditions directly affect household income, food security, and community well-being.

The impacts of climate change extend beyond the harvesting stage of fisheries. Fisheries function as interconnected socio-ecological systems in which production, processing, distribution, marketing, and consumption are mutually dependent. Declining fish catches reduce the availability of raw materials for post-harvest activities, disrupt local seafood markets, and weaken the economic resilience of households engaged throughout fisheries value chains (Allison et al., 2009). This broader perspective highlights that climate vulnerability should be understood not only in ecological terms but also through its cascading socio-economic consequences.

Recent scholarship increasingly adopts the concept of social-ecological resilience to explain how coastal communities respond to environmental disturbances. Resilience refers to the capacity of individuals, households, and institutions to anticipate, absorb, adapt to, and recover from environmental shocks while maintaining essential functions and livelihoods (Folke et al., 2016). Adaptive capacity is influenced by access to education, financial resources, governance institutions, social networks, and livelihood diversification. Communities with greater adaptive capacity are generally better equipped to respond to changing environmental conditions, whereas marginalized groups often experience greater vulnerability despite living within the same ecological setting.

Indonesia exemplifies many of these global challenges. Variability in monsoon patterns, coral reef degradation, coastal erosion, and changing fish migration routes have increasingly affected fisheries production across the archipelago. Although government policies have promoted sustainable fisheries management and marine conservation, adaptation initiatives frequently emphasize ecological conservation and fishing technology while giving comparatively less attention to the social dimensions of vulnerability, particularly those associated with gender and household livelihoods.

B. Gender and Fisheries Livelihoods

For decades, fisheries have been widely perceived as male-dominated economic activities because public attention has focused primarily on fish harvesting at sea. However, contemporary research has demonstrated that women contribute substantially to fisheries livelihoods through diverse activities across the entire fisheries value chain. These include fish processing, preservation, packaging, transportation, retail marketing, financial management, quality control, and household labour that enables fishing operations to continue (Harper et al., 2020).

Women's participation is especially significant in small-scale fisheries, where family labour constitutes the foundation of household economic survival. In many coastal communities, fisherwomen perform multiple productive and reproductive roles simultaneously. Besides generating income through fisheries-related enterprises, they are responsible for childcare, food preparation, household management, and community obligations. This "double burden" increases women's workload while limiting opportunities for education, business development, and participation in public decision-making (Bennett et al., 2021).

Despite their extensive economic contributions, fisherwomen remain underrepresented in fisheries governance and official statistics. Fisheries policies frequently classify fishers as individuals who directly harvest marine resources, thereby excluding women engaged in post-harvest activities from formal recognition. As a consequence, many women have limited access to fisheries subsidies, social protection programs, financial assistance, technical training, and institutional support that are available to registered fishers (Kleiber et al., 2018).

Gender inequalities within fisheries are further reinforced by unequal access to productive assets such as boats, fishing gear, land ownership, financial capital, and market networks. Women often operate small-scale enterprises with limited capital while depending on informal credit systems and unstable market conditions. These structural constraints reduce their capacity to respond effectively to environmental and economic shocks, making climate-related disruptions particularly damaging to household livelihoods.

The Sustainable Livelihoods Framework provides an important analytical perspective for understanding these dynamics. According to this framework, livelihood outcomes depend upon access to five forms of capital: natural, financial, human, physical, and social capital (Scoones, 1998). Climate change affects each of these livelihood assets simultaneously. Declining fish stocks reduce natural capital; unstable income weakens financial capital; limited training constrains human capital; inadequate infrastructure affects physical capital; and weakened community cooperation may undermine social capital. Since women generally possess more limited access to these livelihood assets than men, climate change often produces disproportionately severe consequences for fisherwomen.

C. Climate Justice and Gender

Climate justice has emerged as a central framework for understanding the unequal distribution of climate change impacts across different social groups. Unlike conventional environmental approaches that primarily emphasize ecological sustainability, climate justice highlights issues of equity, human rights, power relations, and social inclusion within climate governance (Schlosberg & Collins, 2014). The framework recognizes that climate change is not only an environmental problem but also a question of social justice because its consequences are experienced unevenly according to existing political, economic, and cultural inequalities.

One influential perspective conceptualizes climate justice through three interrelated dimensions: distributive justice, recognition justice, and procedural justice (Fraser, 2008; Schlosberg, 2012). Distributive justice concerns the equitable allocation of resources, risks, and adaptation benefits. Recognition justice emphasizes acknowledging the identities, knowledge, and contributions of marginalized groups. Procedural justice focuses on meaningful participation in decision-making processes affecting climate adaptation and environmental governance.

Applying these dimensions to fisheries reveals persistent gender disparities. Women frequently receive fewer economic benefits from fisheries development programs, experience lower institutional recognition despite their substantial contributions, and remain underrepresented in fisheries management organizations. Consequently, climate adaptation policies that overlook these inequalities risk reinforcing existing patterns of exclusion rather than promoting resilience.

Recognition is particularly important because women's knowledge contributes significantly to household adaptation strategies. Through daily involvement in fish processing, seafood marketing, household budgeting, and community interactions, fisherwomen develop valuable understanding of seasonal changes, market fluctuations, food security, and livelihood

diversification. Integrating such knowledge into fisheries governance enhances not only social equity but also the effectiveness of climate adaptation planning (Bennett et al., 2021).

Procedural justice is equally critical. Inclusive governance requires women to participate meaningfully in planning, implementing, and evaluating fisheries adaptation policies. Participation should extend beyond symbolic representation toward genuine influence over decisions concerning resource management, financial support, disaster preparedness, and livelihood development. Research increasingly demonstrates that gender-inclusive institutions improve adaptive capacity by incorporating broader knowledge systems, strengthening community legitimacy, and promoting more equitable distribution of adaptation resources (Eriksen et al., 2021).

Thus, climate justice offers an integrated framework for examining how environmental change intersects with social inequality. Rather than treating vulnerability solely as exposure to environmental hazards, the framework explains how institutional arrangements, gender relations, and power structures shape both vulnerability and resilience within coastal communities.

D. Research Gap

Although scholarly attention to climate change and fisheries has expanded considerably during the past decade, several important research gaps remain. First, much of the existing literature concentrates on ecological impacts such as declining fish stocks, biodiversity loss, and fisheries productivity, while comparatively fewer studies investigate the gendered socio-economic consequences of these environmental changes. Women's experiences are frequently incorporated only as complementary observations rather than forming the primary focus of analysis.

Second, empirical research on fisheries adaptation in Indonesia continues to emphasize fishermen's adaptive strategies, technological innovation, and marine resource management. Limited attention has been devoted to understanding how fisherwomen experience climate-related livelihood changes, particularly within post-harvest fisheries and household economic systems. This imbalance restricts understanding of the full social impacts of climate change within coastal communities.

Third, relatively few studies integrate climate justice as an analytical framework for examining fisheries governance. Existing adaptation research often evaluates technical effectiveness without considering whether adaptation policies recognize women's contributions, address structural inequalities, or facilitate meaningful participation in decision-making processes. Consequently, important questions remain regarding the inclusiveness and equity of current fisheries governance.

Finally, Bali represents a significant empirical setting that has received comparatively limited scholarly attention in studies linking climate change, gender, and fisheries livelihoods. Existing research on Bali has predominantly focused on tourism, coral reef conservation, and coastal ecosystem management, while the experiences of fisherwomen remain underexplored despite their essential contribution to local coastal economies.

Addressing these gaps, the present study examines the livelihoods of fisherwomen in Bali through the lens of climate justice. By integrating perspectives from climate adaptation, gender studies, and sustainable livelihoods, this research seeks to provide a more comprehensive understanding of how environmental change reshapes women's economic roles, adaptive capacities, and participation in fisheries governance. In doing so, the study contributes to the growing body of literature advocating more inclusive, equitable, and gender-responsive climate adaptation policies for small-scale fisheries.

Methods

This study employed a qualitative research design to explore how climate change affects the livelihoods of fisherwomen in Bali through the analytical lens of climate justice. A qualitative approach was considered appropriate because it facilitates an in-depth understanding of participants' lived experiences, perceptions, and adaptive responses to environmental change within their socio-cultural contexts (Creswell & Poth, 2018). The research adopted a community-based perspective, recognizing fisherwomen as key knowledge holders whose experiences provide valuable insights into the interactions between climate change, gender relations, and coastal livelihoods.

Data were collected through semi-structured interviews with fisherwomen engaged in fish processing, seafood marketing, and other post-harvest fisheries activities in selected coastal communities in Bali. Participants were recruited using purposive sampling to ensure they possessed relevant knowledge and experience related to climate-related livelihood changes (Patton, 2015). To enrich the findings and facilitate data triangulation, additional interviews were conducted with village leaders, fisheries officers, and environmental experts involved in coastal resource management and climate adaptation. The study also reviewed relevant policy documents, including fisheries regulations, climate adaptation strategies, and local development plans, to compare institutional perspectives with community experiences.

Interview data were transcribed and analyzed using thematic analysis following the procedures proposed by Braun and Clarke (2022). The analysis involved familiarization with the data, systematic coding, identification of recurring themes, and interpretation of findings through the perspectives of climate justice and sustainable livelihoods. Data triangulation across interviews

and policy documents enhanced the credibility and trustworthiness of the findings by allowing comparison of multiple perspectives and sources of evidence (Lincoln & Guba, 1985).

Ethical principles were observed throughout the research process. All participants were informed of the study's objectives and voluntarily agreed to participate before interviews were conducted. Informed consent was obtained, anonymity was maintained through the use of pseudonyms, and all personal information was treated confidentially. Given the gender-sensitive nature of the study, interviews were conducted with respect for local cultural norms and participants' domestic and occupational responsibilities, ensuring a safe and inclusive environment for sharing their experiences.

Analysis and Discussion

A. Climate Change and the Transformation of Coastal Livelihoods

Climate change has fundamentally transformed the ecological conditions that underpin small-scale fisheries livelihoods in Bali, creating increasing uncertainty for coastal households dependent on marine resources. Changes in sea temperature, rainfall variability, ocean currents, and extreme weather events have altered fish distribution patterns and reduced the predictability of fishing activities. From a social-ecological systems perspective, fisheries communities are embedded within dynamic relationships between environmental processes and human livelihood strategies. When marine ecosystems experience disruption, the effects extend beyond ecological degradation and influence income security, food systems, social relations, and community resilience (Berkes & Folke, 1998; Folke et al., 2016). The Intergovernmental Panel on Climate Change (IPCC) emphasizes that coastal communities dependent on natural resources are among the groups most exposed to climate risks because their livelihoods rely heavily on ecosystem stability and climatic conditions (IPCC, 2023). In Bali, where traditional fisheries remain connected with local culture and household economies, climate change represents not only an environmental challenge but also a threat to socio-economic sustainability. This situation demonstrates that climate vulnerability is produced through the interaction between environmental exposure and existing social inequalities.

The declining reliability of fisheries resources has significant implications for small-scale fishing households because their adaptive capacity is often constrained by limited financial, technological, and institutional resources. According to the Sustainable Livelihoods Framework, household resilience depends on access to five forms of capital: natural, financial, human, physical, and social capital (Scoones, 1998). Climate change directly reduces natural capital through declining fish availability and ecosystem degradation while simultaneously affecting financial capital through unstable household income. Allison et al. (2009) argue that small-scale fishing communities are particularly

vulnerable because they often possess limited capacity to absorb environmental shocks due to poverty, restricted market access, and weak institutional support. In Indonesia, these challenges are recognized within national fisheries governance. Law No. 7 of 2016 concerning the Protection and Empowerment of Fishermen, Fish Farmers, and Salt Farmers acknowledges that fishing communities face economic and environmental risks requiring government intervention through protection, empowerment, and livelihood strengthening programs. However, implementation remains challenged because adaptation policies have often prioritized fisheries production and infrastructure rather than addressing deeper socio-economic vulnerabilities within fishing households.

The consequences of climate change are distributed unevenly within fishing communities, creating differentiated experiences between men and women. While male fishers generally experience direct impacts through reduced catches and increased risks at sea, women frequently experience indirect but equally significant consequences through disruptions in fisheries-related household economies. Women engaged in fish processing, trading, and marketing depend on the availability, quality, and affordability of marine products obtained from fishing activities. When catches decline, women's economic activities are affected through reduced raw materials, declining income opportunities, and increased competition in local markets. This phenomenon reflects the concept of gendered climate vulnerability, which suggests that environmental change interacts with existing social structures to create unequal impacts across social groups (Ravera et al., 2016). According to Djoudi et al. (2016), climate change does not automatically produce vulnerability; rather, vulnerability emerges from the interaction between environmental stress and social conditions such as gender inequality, poverty, and unequal access to resources. Therefore, understanding fisheries adaptation requires examining not only ecological changes but also the social arrangements that determine who has the capacity to respond.

The transformation of coastal livelihoods also highlights the importance of recognizing fisheries as a complex value chain rather than a single occupation associated only with fishing activities at sea. Harper et al. (2020) emphasize that women's contributions to small-scale fisheries are substantial but frequently overlooked because conventional fisheries statistics tend to focus on harvesting activities dominated by men. This limited recognition creates policy gaps because women involved in post-harvest activities often remain excluded from fisheries support programs, financial assistance, and adaptation initiatives. From the perspective of climate justice, this represents a failure of recognition justice, where marginalized groups' knowledge, labour, and contributions are insufficiently acknowledged in governance processes (Schlosberg, 2012). Indonesia's commitment to sustainable development through the Sustainable Development Goals, particularly SDG 5 on gender equality and SDG 13 on climate action, requires policies that integrate gender considerations into environmental

governance. Without such integration, climate adaptation strategies may unintentionally reproduce existing inequalities by supporting only formally recognized actors while neglecting women who sustain fisheries economies through invisible labour.

The evidence from coastal livelihood studies indicates that climate adaptation requires a shift from reactive responses toward transformative approaches that address both environmental risks and structural inequalities. Transformative adaptation, as proposed by Eriksen et al. (2021), emphasizes that effective climate responses must not only help communities cope with immediate impacts but also challenge the institutional and social conditions that create vulnerability. In the context of Bali's fisherwomen, this means that adaptation cannot be limited to improving fishing technology or restoring marine ecosystems alone. It must also include strengthening women's access to financial resources, capacity-building programs, social protection, and decision-making institutions. The Indonesian legal framework provides a foundation for such approaches through principles of environmental protection, community participation, and sustainable resource management under Law No. 32 of 2009 on Environmental Protection and Management. Furthermore, the recognition of local communities as environmental actors aligns with contemporary climate governance perspectives that emphasize participation and inclusiveness. Therefore, addressing climate impacts on fisherwomen requires integrating ecological sustainability with social justice, ensuring that coastal adaptation strategies protect both marine ecosystems and the livelihoods of vulnerable groups.

B. Livelihood Impacts and Economic Vulnerability of Fisherwomen

Climate change has intensified the economic vulnerability of fisherwomen by disrupting the livelihood systems upon which coastal households depend. Although women are frequently positioned as secondary actors within fisheries narratives, extensive evidence demonstrates that they contribute significantly to household economic stability through fish processing, trading, financial management, and other post-harvest activities. The disruption of fisheries productivity therefore affects women not only through direct economic losses but also through reduced opportunities to maintain household income. According to the Sustainable Livelihoods Framework, vulnerability emerges when households experience declining access to livelihood assets, including natural resources, financial capital, infrastructure, and institutional support (Scoones, 1998). In small-scale fisheries, declining fish availability caused by climate variability reduces the supply of raw materials for women's enterprises, while unstable market conditions further limit their economic resilience. Bennett et al. (2021) argue that climate change acts as a "risk multiplier" because it intensifies pre-existing social and economic inequalities rather than affecting all members of

society equally. Consequently, fisherwomen often experience a combination of environmental, economic, and social pressures that reduce their ability to adapt effectively to changing coastal conditions.

The economic challenges experienced by fisherwomen are closely connected with gendered divisions of labour within coastal communities. Feminist political ecology scholars argue that environmental changes are mediated by social relations, meaning that men and women experience ecological disruption differently because they occupy different economic roles, responsibilities, and positions of power (Rocheleau et al., 1996). In many fishing households, men are primarily associated with fishing activities at sea, while women are responsible for post-harvest processing, marketing, household budgeting, and caregiving responsibilities. When climate change reduces fishing productivity, women often compensate for declining household income by increasing their economic activities while maintaining existing domestic responsibilities. This condition reflects the concept of the “double burden” experienced by many women in resource-dependent communities, where productive and reproductive labour accumulate simultaneously (Resurrección, 2013). Such conditions demonstrate that climate vulnerability is not solely determined by exposure to environmental hazards but also by unequal social arrangements that influence individuals’ capacity to respond. Therefore, adaptation policies that ignore gender relations risk addressing only the symptoms of vulnerability while leaving underlying structural inequalities unchanged.

Limited access to financial resources represents another major factor contributing to fisherwomen’s economic vulnerability. Research on small-scale fisheries demonstrates that women often face barriers in accessing formal credit, ownership rights, business support, and government assistance because fisheries institutions frequently recognize male fishers as the primary economic actors (Harper et al., 2020). This institutional bias creates a situation where women’s contributions are economically important but insufficiently supported through formal governance mechanisms. In Indonesia, Law No. 7 of 2016 on the Protection and Empowerment of Fishermen, Fish Farmers, and Salt Farmers provides a legal foundation for improving the welfare of fishing communities through access to empowerment programs, financial assistance, and livelihood protection. However, the effectiveness of such policies depends on whether women involved in fisheries value chains are explicitly recognized as beneficiaries rather than being indirectly included through household-based approaches. From the perspective of recognition justice, climate adaptation requires acknowledging women not merely as family members of fishermen but as independent economic actors whose activities contribute substantially to fisheries sustainability (Schlosberg, 2012). Without this recognition, adaptation interventions may continue to reinforce gender disparities in access to resources and opportunities.

Economic vulnerability among fisherwomen is also shaped by limited participation in markets and value-added activities. Although women are often responsible for processing and selling seafood products, many operate within informal economic systems characterized by limited bargaining power, unstable prices, and dependence on intermediaries. These conditions reduce their ability to capture greater economic benefits from fisheries resources. The value chain perspective emphasizes that sustainability in fisheries depends not only on maintaining resource availability but also on ensuring equitable distribution of economic benefits among actors involved in production and consumption systems (FAO, 2024). In this context, strengthening fisherwomen's economic resilience requires more than providing short-term financial assistance; it requires improving market access, entrepreneurial capacity, technological skills, and institutional networks. Such measures align with the empowerment principles embedded in Indonesia's fisheries policies, which emphasize capacity building and strengthening community participation. However, effective implementation requires a gender-responsive approach that considers women's specific constraints, including time limitations, mobility restrictions, and unequal access to decision-making spaces.

Despite experiencing significant challenges, fisherwomen demonstrate considerable adaptive capacity through livelihood diversification and collective strategies. Adaptation research emphasizes that vulnerable communities are not passive recipients of climate impacts but active agents who develop creative responses based on available resources, knowledge, and social relationships (Adger, 2003). In coastal Indonesia, women frequently diversify household income through small businesses, alternative food production, informal trading, and community-based economic activities. These strategies reflect the importance of social capital, including family networks, women's groups, and community cooperation, in strengthening resilience during periods of environmental uncertainty. However, relying solely on household-level adaptation may place additional burdens on women if institutional support remains inadequate. Eriksen et al. (2021) highlight that transformative adaptation requires addressing the structural causes of vulnerability rather than expecting individuals to continuously absorb increasing climate risks. Therefore, policies supporting fisherwomen should move beyond viewing women as vulnerable recipients of assistance and instead recognize them as agents of adaptation whose knowledge, labour, and entrepreneurial capacities are essential for building sustainable coastal livelihoods.

From a broader policy perspective, addressing fisherwomen's economic vulnerability requires integrating gender equality into climate adaptation and fisheries governance frameworks. Indonesia's commitment to international agreements, including the Sustainable Development Goals (particularly SDG 5 on gender equality and SDG 13 on climate action), requires adaptation strategies

that promote equitable participation and access to resources. Similarly, the principles of inclusive environmental governance under Law No. 32 of 2009 on Environmental Protection and Management emphasize the importance of community involvement in environmental decision-making. Strengthening fisherwomen's economic resilience therefore represents not only a livelihood intervention but also a broader commitment to climate justice. By ensuring women's access to financial resources, institutional support, and decision-making opportunities, climate adaptation policies can move from compensatory approaches toward transformative strategies that enhance both social equity and ecological sustainability in coastal communities.

C. Gendered Vulnerability and Social Exclusion in Fisheries Governance

Climate change vulnerability among fisherwomen is not solely determined by exposure to environmental risks but is also shaped by institutional structures, social norms, and unequal access to decision-making processes. The concept of gendered vulnerability highlights that environmental impacts are experienced differently by men and women because they occupy different social, economic, and political positions within resource-dependent communities (Ravera et al., 2016). In small-scale fisheries, governance systems have historically prioritized activities associated with fishing at sea, which are predominantly performed by men, while women's contributions in processing, trading, and household livelihood management remain less visible. This institutional perception has created a narrow understanding of who qualifies as a "fisher" and who deserves access to fisheries support programs. According to feminist political ecology, environmental governance is deeply influenced by power relations that determine whose knowledge, labour, and experiences are recognized in decision-making processes (Rocheleau et al., 1996). Consequently, the marginalization of fisherwomen is not simply a result of cultural traditions but reflects broader institutional arrangements that reproduce unequal access to resources and political participation. In the context of climate change, these inequalities increase women's vulnerability because adaptation decisions are often designed without adequately considering their specific experiences and needs.

The limited recognition of fisherwomen within fisheries governance represents a significant challenge from the perspective of climate justice. Schlosberg (2012) argues that recognition justice is a fundamental component of environmental justice because marginalized groups must first be acknowledged as legitimate stakeholders before their interests can be effectively addressed. In many coastal communities, women possess valuable knowledge regarding fish processing, market fluctuations, household food security, and seasonal changes in marine resource availability. However, such knowledge is frequently categorized as informal or domestic rather than as legitimate environmental

expertise. This separation between “technical” knowledge and “local” knowledge contributes to the exclusion of women from formal adaptation planning. The IPCC (2023) emphasizes that inclusive climate adaptation requires integrating diverse knowledge systems, including the experiences of local communities and vulnerable groups. Therefore, excluding fisherwomen from climate and fisheries governance represents not only a social inequality but also a missed opportunity to improve adaptation effectiveness through the incorporation of broader knowledge resources.

The issue of women’s exclusion is also evident in their limited participation in fisheries organizations and policy processes. Procedural justice requires that affected communities have meaningful opportunities to participate in decisions concerning resource management, environmental planning, and adaptation strategies (Fraser, 2008). However, studies of small-scale fisheries demonstrate that women often face multiple barriers to participation, including limited time availability due to unpaid care responsibilities, restricted mobility, lower access to information, and institutional practices that prioritize male representation (Bennett et al., 2021). These barriers are particularly important in coastal communities where community meetings, fisheries associations, and resource management institutions are frequently organized around male-dominated structures. As a result, adaptation programs may unintentionally reinforce gender inequality by consulting primarily with male fishers while overlooking women’s perspectives. This situation illustrates that procedural exclusion is not merely a question of representation but directly influences the effectiveness and fairness of climate adaptation outcomes.

The Indonesian fisheries governance framework has increasingly recognized the importance of community empowerment; however, implementation challenges remain regarding gender inclusion. Law No. 7 of 2016 concerning the Protection and Empowerment of Fishermen, Fish Farmers, and Salt Farmers provides a legal basis for improving the welfare and resilience of fishing communities through access to protection mechanisms, economic empowerment, and capacity development. Similarly, Indonesia’s commitment to gender equality through the ratification of the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) requires public policies to ensure women’s equal participation in economic and social development processes. Nevertheless, fisheries governance practices have often maintained a household-based perspective in which women are considered beneficiaries through their relationship with male household members rather than as independent fisheries actors. This approach limits women’s direct access to government programs, institutional networks, and economic opportunities. From a climate justice perspective, such practices represent a gap between formal policy commitments and actual recognition of women’s roles within fisheries systems.

Social exclusion among fisherwomen is further reinforced by intersecting inequalities related to poverty, education, age, geographic location, and access to infrastructure. Intersectionality theory emphasizes that vulnerability is produced through the interaction of multiple social identities and structural conditions rather than through a single factor such as gender alone (Crenshaw, 1989). For example, women living in remote coastal villages may face greater adaptation challenges because they experience simultaneous constraints related to limited educational opportunities, weak transportation infrastructure, restricted market access, and inadequate institutional support. These overlapping disadvantages reduce their ability to benefit from climate adaptation initiatives and increase dependence on informal coping mechanisms. Understanding these intersections is particularly important in Bali, where coastal communities experience diverse pressures from climate change, economic transformation, and competing demands for coastal resources. Therefore, adaptation policies must move beyond generalized assumptions about “coastal communities” and consider the differentiated experiences of women within those communities.

The exclusion of fisherwomen from governance processes also has implications for sustainable fisheries management. Contemporary approaches to natural resource governance emphasize that effective management depends on participation, legitimacy, and collaboration among diverse stakeholders (Ostrom, 1990). When women are excluded, fisheries institutions lose access to important knowledge and social networks that can contribute to resource conservation and livelihood resilience. Women’s involvement in fisheries organizations, community monitoring, and adaptation planning can strengthen collective action and improve compliance with sustainable resource management practices. This perspective aligns with SDG 5 on gender equality and SDG 14 on sustainable use of marine resources, both of which emphasize inclusive approaches to achieving sustainable development. Therefore, integrating fisherwomen into fisheries governance should not be viewed merely as a matter of social equality but as an essential strategy for improving ecological and socio-economic outcomes.

Overall, the evidence suggests that addressing climate vulnerability among fisherwomen requires institutional transformation rather than isolated empowerment programs. Climate adaptation policies must recognize women as rights holders, knowledge producers, and active participants in fisheries governance. Strengthening women’s representation in fisheries institutions, improving access to information and financial resources, and incorporating gender analysis into climate policies are necessary steps toward achieving climate justice. In the Indonesian context, this requires moving from a production-oriented fisheries governance model toward a more inclusive framework that integrates ecological sustainability, gender equality, and community resilience. Such transformation is essential to ensure that climate adaptation does not

merely protect fisheries resources but also advances social justice for the communities whose livelihoods depend upon them.

D. Adaptive Capacity, Local Knowledge, and Community Resilience

The ability of fisherwomen to respond to climate change is closely related to their adaptive capacity, which reflects the availability of resources, knowledge, institutions, and social networks that enable individuals and communities to anticipate and respond to environmental changes. Adaptive capacity is not simply determined by economic wealth or technological access but is shaped by broader social, cultural, and institutional conditions. Adger (2003) argues that resilience in coastal communities is strongly influenced by social capital, collective action, and institutional arrangements that enable communities to manage uncertainty. Within small-scale fisheries, fisherwomen often develop adaptation strategies through everyday practices, including livelihood diversification, informal financial cooperation, adjustment of household consumption patterns, and participation in community networks. These strategies demonstrate that adaptation occurs not only through formal climate programs but also through locally embedded responses developed over generations. However, the effectiveness of such strategies depends on the extent to which institutions recognize and support community-based capacities. Without adequate institutional support, adaptation responsibilities may increasingly shift from governments and organizations to vulnerable households, potentially creating additional burdens for women who already experience unequal distributions of labour and resources.

Livelihood diversification represents one of the most common strategies employed by fisherwomen to reduce dependence on increasingly uncertain fisheries resources. The Sustainable Livelihoods Framework emphasizes that households improve resilience by combining multiple livelihood activities and strengthening access to different forms of capital, particularly financial, human, and social capital (Scoones, 1998). In coastal communities, women frequently engage in alternative economic activities such as seafood processing, small-scale trading, food production, handicrafts, and informal businesses to compensate for fluctuations in fisheries income. These activities demonstrate economic agency and illustrate that fisherwomen actively contribute to household adaptation rather than merely experiencing climate impacts. Nevertheless, diversification should not be interpreted as evidence that communities can independently overcome climate risks. Eriksen et al. (2021) emphasize that adaptation strategies may become maladaptive when vulnerable groups are forced to absorb increasing environmental pressures without structural support. Excessive reliance on women's unpaid labour and informal economic activities may sustain households in the short term while reinforcing long-term inequalities. Therefore, livelihood

diversification must be accompanied by policies that improve women's access to markets, financial services, skills development, and social protection.

Local ecological knowledge represents another important dimension of fisherwomen's adaptive capacity. Although fisheries knowledge is often associated primarily with men's experiences at sea, women also develop sophisticated knowledge through their involvement in fisheries value chains and household resource management. Their knowledge includes understanding changes in fish availability, seasonal market patterns, seafood preservation techniques, consumer preferences, and strategies for managing household food security during periods of scarcity. Berkes et al. (2000) argue that local ecological knowledge contributes to resilience because it provides communities with practical information for responding to environmental variability. However, conventional resource management systems frequently undervalue women's knowledge because it is embedded within everyday practices rather than formal scientific institutions. From the perspective of climate justice, recognizing fisherwomen's knowledge represents an important aspect of recognition justice because adaptation processes become more effective when diverse forms of expertise are incorporated into decision-making. The integration of local knowledge with scientific approaches can improve climate adaptation by producing strategies that are both technically informed and socially appropriate.

Community networks and collective action also play a significant role in strengthening fisherwomen's resilience. Social capital theory suggests that trust, cooperation, and social relationships provide essential resources that enable communities to respond collectively to uncertainty (Putnam, 2000). In many coastal areas, women's groups, informal savings networks, and community organizations function as important mechanisms for sharing information, accessing financial support, and coordinating livelihood activities. These networks are particularly valuable for households with limited access to formal financial institutions or government programs. Ostrom (1990) highlights that effective management of common resources depends heavily on collective institutions and community participation. In fisheries contexts, women's participation in collective organizations can contribute not only to household economic resilience but also to broader efforts toward sustainable resource management. Nevertheless, the sustainability of such community-based initiatives depends on supportive governance structures that recognize and strengthen local organizations rather than replacing them with externally designed programs.

The role of local knowledge and community resilience has important implications for climate adaptation policy in Indonesia. National climate policy increasingly emphasizes adaptation, community participation, and ecosystem-based approaches. The National Action Plan for Climate Change Adaptation (RAN-API) and subsequent climate governance frameworks recognize the

importance of strengthening community capacity to respond to climate risks. Furthermore, Presidential Regulation No. 98 of 2021 concerning Carbon Economic Value establishes a broader framework for climate action and emphasizes the importance of mitigation and adaptation efforts involving multiple stakeholders. However, policy implementation must ensure that vulnerable groups, including fisherwomen, are not only considered beneficiaries but also active participants in climate governance. A participatory approach is necessary because adaptation interventions designed without understanding local livelihood realities may fail to address the actual needs and priorities of coastal communities.

The concept of transformative adaptation provides an important framework for evaluating current approaches to fisherwomen's resilience. Unlike conventional adaptation strategies that focus primarily on coping with immediate climate impacts, transformative adaptation seeks to address the structural conditions that create vulnerability (Pelling, 2011). In the context of fisherwomen, transformative adaptation requires changing institutional practices that limit women's access to resources, recognition, and participation. This includes improving gender-responsive fisheries planning, strengthening women's organizations, expanding access to financial services, and ensuring representation in coastal governance institutions. Such approaches are consistent with the principles of climate justice because they address both the consequences and the underlying causes of vulnerability. Therefore, supporting fisherwomen's adaptive capacity requires more than improving their ability to survive climate impacts; it requires creating social and institutional conditions that enable them to participate equally in shaping the future of coastal livelihoods.

Overall, fisherwomen's adaptive strategies demonstrate that resilience exists within coastal communities despite significant climate pressures. Their experiences reveal that adaptation is a social process shaped by knowledge, relationships, cultural practices, and institutional support. Recognizing these capacities challenges narratives that portray vulnerable communities only as victims of climate change. Instead, fisherwomen should be understood as active agents whose knowledge and practices contribute to sustainable fisheries governance. Strengthening their adaptive capacity through inclusive policies, institutional recognition, and equitable access to resources represents an essential pathway toward achieving climate-resilient and socially just coastal development in Bali and beyond.

E. Climate Justice, Fisheries Governance, and Policy Implications

The analysis of fisherwomen's experiences demonstrates that climate change in coastal communities is fundamentally a question of justice rather than merely an environmental management challenge. Climate impacts are distributed unevenly because vulnerability is shaped by historical inequalities,

unequal access to resources, and differences in political recognition. The climate justice perspective provides an important analytical framework for understanding why fisherwomen often experience greater livelihood insecurity despite contributing significantly to fisheries economies. Schlosberg (2012) argues that environmental justice consists of three interconnected dimensions: distributive justice, recognition justice, and procedural justice. Distributive justice concerns the fair allocation of risks, resources, and adaptation benefits; recognition justice concerns the acknowledgement of marginalized groups and their knowledge systems; while procedural justice emphasizes meaningful participation in decision-making processes. In the context of Bali's coastal fisheries, these three dimensions reveal persistent challenges. Women involved in fisheries value chains often experience unequal access to adaptation resources, limited recognition within fisheries institutions, and restricted participation in governance processes. Therefore, addressing climate vulnerability requires moving beyond technical adaptation measures toward governance approaches that address underlying social inequalities.

From the perspective of distributive justice, climate adaptation policies must consider how resources, assistance programs, and economic opportunities are distributed among different actors within fisheries systems. Existing fisheries development approaches have historically focused on improving production capacity through fishing equipment, infrastructure, and resource management interventions. While such measures are important, they may not sufficiently address the needs of women whose livelihoods depend on processing, marketing, and household-level economic activities. Bennett et al. (2021) emphasize that climate adaptation can unintentionally reinforce inequality when interventions are designed without considering the differentiated experiences of vulnerable groups. In Indonesia, Law No. 7 of 2016 concerning the Protection and Empowerment of Fishermen, Fish Farmers, and Salt Farmers provides a significant legal foundation for improving the welfare of fishing communities through empowerment, protection, and capacity development. However, the effectiveness of this framework depends on whether implementation recognizes women as direct stakeholders rather than merely family members of male fishers. A gender-responsive interpretation of fisheries protection policies is therefore essential to ensure that adaptation benefits reach all actors involved in sustaining coastal livelihoods.

Recognition justice represents another critical challenge within fisheries governance. Despite their substantial economic contributions, fisherwomen remain frequently invisible in official fisheries narratives, institutional structures, and policy frameworks. This invisibility reflects what Fraser (2008) describes as a form of institutionalized misrecognition, where certain groups are systematically undervalued within social and political systems. The consequences of such exclusion are significant because groups that are not recognized are less

likely to receive targeted support, representation, and opportunities for participation. In Bali, where fisheries are closely connected with cultural practices and community identity, recognizing fisherwomen requires acknowledging their economic roles, local knowledge, and contribution to household resilience. The incorporation of women's perspectives into fisheries planning would also strengthen adaptive governance because local knowledge can complement scientific approaches to resource management. This aligns with the IPCC (2023), which highlights that effective climate adaptation requires inclusive approaches that integrate diverse knowledge systems and prioritize vulnerable communities.

Procedural justice further highlights the importance of women's participation in fisheries and climate governance. Participation should not be limited to consultation but should involve meaningful influence over decisions concerning resource management, adaptation planning, and development priorities. Research on environmental governance demonstrates that inclusive participation improves policy legitimacy, strengthens community ownership, and increases the effectiveness of adaptation initiatives (Adger, 2003; Ostrom, 1990). However, gendered institutional practices often restrict fisherwomen's involvement in fisheries organizations, village decision-making processes, and climate adaptation programs. These barriers are reinforced by social expectations regarding women's domestic responsibilities, limited access to information, and institutional preferences for engaging with male representatives. Therefore, strengthening procedural justice requires institutional reforms that create accessible participation mechanisms, support women's leadership, and ensure that fisheries governance reflects the diversity of actors involved in coastal livelihoods.

The Indonesian policy landscape provides several opportunities for integrating climate justice principles into fisheries governance. Indonesia has demonstrated commitments to sustainable development through national regulations and international frameworks, including the Sustainable Development Goals, particularly SDG 5 on gender equality, SDG 13 on climate action, and SDG 14 on sustainable marine ecosystems. Furthermore, Law No. 32 of 2009 concerning Environmental Protection and Management emphasizes public participation and sustainable resource management as essential elements of environmental governance. However, translating these commitments into effective outcomes requires stronger institutional coordination and gender mainstreaming across fisheries and climate programs. Gender-responsive budgeting, improved access to fisheries extension services, women-focused livelihood programs, and representation of fisherwomen in coastal management institutions are potential mechanisms for transforming policy commitments into practical outcomes.

A more inclusive fisheries governance model also requires recognizing fisherwomen as agents of sustainability rather than simply vulnerable recipients of assistance. Contemporary approaches to resilience emphasize that communities possess important capacities and knowledge that can contribute to effective adaptation when supported by appropriate institutions (Folke et al., 2016). Women's involvement in fisheries governance can strengthen conservation efforts, improve household resilience, and enhance social cohesion within coastal communities. Therefore, empowerment should not be limited to economic assistance but should include strengthening leadership capacity, organizational participation, access to information, and decision-making authority. Such approaches correspond with transformative adaptation principles, which seek to address the structural causes of vulnerability rather than merely helping communities cope with environmental change (Pelling, 2011).

For Bali's coastal communities, integrating climate justice into fisheries governance is particularly important because climate change interacts with broader socio-economic transformations, including tourism development, coastal resource competition, and changing livelihood aspirations among younger generations. Without inclusive governance, adaptation strategies may protect marine resources while failing to protect the people whose livelihoods depend on them. A sustainable future for Bali's fisheries therefore requires balancing ecological conservation with social equity. Policies must recognize that resilient fisheries are not only characterized by healthy marine ecosystems but also by communities where all members, including fisherwomen, have equal opportunities to participate, access resources, and influence decisions affecting their livelihoods.

Overall, the experiences of fisherwomen demonstrate that climate adaptation in small-scale fisheries is inseparable from questions of justice, power, and governance. Climate change exposes existing inequalities but also provides an opportunity to transform fisheries institutions toward greater inclusiveness and sustainability. By integrating gender-responsive approaches, strengthening community participation, and recognizing women's knowledge and contributions, fisheries governance can move toward a model that supports both ecological resilience and social justice. Such transformation is essential for achieving sustainable coastal development in Bali and for advancing broader global commitments to climate justice.

Conclusion

This study demonstrates that climate change represents not only an ecological challenge for coastal fisheries but also a significant social justice issue that affects the sustainability of fisherwomen's livelihoods. Through the lens of climate justice, the analysis reveals that climate-related impacts are experienced unevenly within coastal communities because existing gender inequalities,

limited access to resources, and institutional constraints shape individuals' capacity to adapt. Fisherwomen in Bali are affected by declining fisheries productivity, increasing economic uncertainty, and disruptions to post-harvest activities that constitute important sources of household income. However, their vulnerability is not solely determined by environmental exposure; rather, it is produced through the interaction between climate risks and structural inequalities within fisheries systems. This finding reinforces the argument that climate adaptation must move beyond ecological management approaches and incorporate social, economic, and institutional dimensions of vulnerability (Schlosberg, 2012; Eriksen et al., 2021).

The study contributes to the literature on climate change, gender, and small-scale fisheries by highlighting the importance of recognizing fisherwomen as active agents within coastal livelihood systems. Although women's contributions to fisheries value chains are economically significant, they remain insufficiently recognized in fisheries governance, policy frameworks, and adaptation programs. The analysis demonstrates that fisherwomen possess valuable adaptive capacities through livelihood diversification, local ecological knowledge, social networks, and community-based strategies. These capacities challenge the dominant perception of women as passive victims of climate change and instead position them as important contributors to resilience-building processes. However, the effectiveness of these adaptive strategies depends heavily on supportive institutional environments that provide equitable access to financial resources, training, information, and decision-making opportunities.

From a climate justice perspective, achieving sustainable fisheries adaptation requires addressing three interconnected dimensions of justice: distribution, recognition, and participation. First, adaptation resources and economic support must be distributed more equitably to ensure that women involved in fisheries value chains benefit from climate policies and development programs. Second, fisheries governance must recognize women as legitimate stakeholders whose knowledge, labour, and experiences contribute to sustainable resource management. Third, fisherwomen must be meaningfully included in decision-making processes related to fisheries management, coastal planning, and climate adaptation. These principles are consistent with Indonesia's legal and policy commitments, including Law No. 7 of 2016 on the Protection and Empowerment of Fishermen, Fish Farmers, and Salt Farmers, Law No. 32 of 2009 on Environmental Protection and Management, and national commitments toward achieving the Sustainable Development Goals, particularly SDG 5, SDG 13, and SDG 14.

The findings have several policy implications for sustainable coastal governance in Bali and Indonesia more broadly. Fisheries and climate adaptation policies should adopt a gender-responsive approach by explicitly recognizing women as fisheries actors rather than indirect beneficiaries through household-

based interventions. Government programs should strengthen fisherwomen's access to financial services, entrepreneurship development, fisheries extension programs, market networks, and institutional representation. Furthermore, adaptation planning should incorporate local knowledge and community participation to ensure that interventions are socially appropriate and context-sensitive. Strengthening women's organizations and increasing their representation within fisheries governance institutions can contribute to more inclusive decision-making while improving the effectiveness of climate adaptation strategies.

Despite its contributions, this study has several limitations. First, the focus on coastal communities in Bali may limit the generalizability of findings to other Indonesian regions with different ecological, cultural, and socio-economic conditions. Second, the qualitative approach provides rich insights into lived experiences but does not allow statistical measurement of the broader prevalence of identified vulnerabilities. Future research could therefore expand comparative studies across different coastal regions, combine qualitative and quantitative approaches, and examine how gender-responsive adaptation policies influence long-term livelihood resilience. Further investigation is also needed into the role of younger generations, digital technologies, financial inclusion, and institutional innovation in strengthening the adaptive capacity of fisherwomen.

Ultimately, building climate-resilient fisheries requires recognizing that ecological sustainability and social justice are inseparable. Protecting marine ecosystems without addressing the inequalities experienced by coastal communities will produce incomplete adaptation outcomes. Fisherwomen in Bali represent not only groups vulnerable to climate change but also important knowledge holders, economic contributors, and agents of transformation. Ensuring their recognition, participation, and empowerment is therefore essential for developing fisheries governance systems that are environmentally sustainable, socially equitable, and resilient in the face of accelerating climate change.

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