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GENDERED DIMENSIONS OF CLIMATE CHANGE IN GILGIT-BALTISTAN: A FEMINIST POLITICAL ECOLOGY APPROACH

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Abstract
This study explores the gendered dimensions of climate change in Gilgit-Baltistan, Pakistan, through the lens of Feminist Political Ecology (FPE). Drawing on qualitative data from semi-structured interviews, focus group discussions, and participant observations across three ecologically vulnerable districts Hunza, Ghizer, and Nagar the research examines how women experience, perceive, and adapt to climate-induced challenges such as glacial melt, erratic rainfall, and resource scarcity. The findings reveal that while women bear a disproportionate burden of environmental stress due to gendered labor expectations, restricted mobility, and limited institutional access they also act as critical agents of local adaptation through traditional ecological knowledge, community-based practices, and informal resilience strategies. However, these contributions are routinely overlooked in formal climate policy and planning. The study highlights the emotional and care burdens that climate change imposes on women and critiques the gender-blind nature of state and NGO interventions. It concludes that addressing climate vulnerability in Gilgit-Baltistan requires not only technical solutions but also structural transformation recognizing women's agency, redistributing decision-making power, and embedding intersectional, decolonial, and gender-transformative frameworks into regional climate governance.

Keywords: Gender, Climate Change, Feminist, Ecology, Traditional

Introduction

Climate change is universally acknowledged as a threat to the entire world, but not everyone faces it to the same extent. In fragile and marginal areas, such as Gilgit-Baltistan (GB) in Pakistan's northern region, the impacts of climate change, manifested by glacial retreat, erratic precipitation, and shifting seasons, are also amplified by socio-political vulnerability. GB is mountainous and part of the Hindu Kush-Himalaya (HKH) range, and thus, ecologically prone to and heavily reliant on agriculture, pastoralism, and glacial meltwater (Hewitt, 2014). Over the last two decades, changes in temperatures, glacial lake outbursts (GLOFs), and water scarcity have severely disrupted the livelihoods of rural populations and posed an existential threat to local communities (Ali et al., 2020; Rasul & Hussain, 2015).

However, the climate crisis is not a gender-neutral issue. Even though climate change effects are often portrayed in a universalistic language in the mainstream debates, feminist scholars have underlined those structural inequities dependent on gender, class, ethnics, and geography powerfully condition who is the most exposed, who adapts and who listens to (Arora-Jonsson, 2011; Sultana, 2021). In Gilgit-Baltistan, gender norms deeply rooted in traditional forms of kinship and religion shape how women experience and respond to environmental stress. These were related to restricted access to land, mobility constraints, underrepresentation at public forums, and unpaid care work. Although they have significant control over agricultural production, food security, and water governance, women's inputs to environmental conservation have often been disenfranchised in academic inquiry and policy design.

This project contributes to a growing body of literature in Feminist Political Ecology (FPE), an interdisciplinary approach to understanding the intersection of gender, power, and ecological processes. FPE contends that environmental governance is not only driven by biophysical

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change but also produced through political and cultural systems of knowledge creation and resource allocation (Rocheleau, Thomas-Slayter, & Wangari, 1996). It is focused on women's and historically disadvantaged groups' experiences, and it is dismissive of the masculinized, technocratic aspects of mainstream climate responses. FPE is especially beneficial in areas such as Gilgit-Baltistan, where adaptation strategies are imposed from the top down without considering the life worlds or traditional ecological knowledge (TEK) of local women (Goodrich et al., 2019). Most research on climate change in Pakistan does not adequately consider the gendered and intersectional effects in hilly and mountainous areas such as Gilgit-Baltistan (GB). Although a few papers report rising vulnerability states (Gioli et al., 2014; Habib, 2021), evidence suggests that women's emotional labor, natural responsibilities, and exclusion often characterize their narratives of climate vulnerability. Comparatively, little attention is also paid to the forms of resistance, adaptation, and creativity adopted by women under conditions of structural marginalization. Focusing on the feminist political ecology approach, this study aims to address these gaps and contribute to a deeper understanding of climate justice in the HKH. The study also considers the institutional blind spots that neglect women in adaptation planning and policy discussions. Even though national climate change policies in contexts such as Pakistan (National Climate Change Policy, 2012) recognize the importance of gendered inclusion, its realization in far-off provinces like GB is limited and largely theoretical (Ribot, 2014; Sultana, 2022). The vast majority of these adaptation programs are designed in Islamabad or by international NGOs and do not necessarily reflect local priorities, languages, or cultural practices. This disconnect raises urgent questions about whose knowledge matters, whose voices are not being heard, and how equity can be meaningfully integrated into climate governance.

Significance of the Study

This research has several academic, policy, and societal implications, as it reveals the often invisible, gendered facets of climate variability in the fragile ecological zone of Gilgit-Baltistan. By adopting a Feminist Political Ecology approach, the study deconstructs prevailing climate narratives, which are often framed in gender-blind, technocratic terms, and re-centers the experiences, traditional ecological knowledge, and adaptive strategies of rural women. In a context where women's roles in agriculture, water, and care, as well as their navigation of these roles, are crucial for the survival of households and communities yet are seldom recognized in formal adaptation plans, this study offers important insights for more equitable and inclusive climate governance. It contributes to international climate justice discourses and local policy, focusing on the intersection of environmental vulnerability with social identity categories, including gender, class, and mobility. Furthermore, the study recommends the inclusion of women's voices in regional adaptation strategies, thus strongly justifying gender-transformative, decolonised climate interventions in mountainous regions within South Asia and beyond.

Literature Review

Climate Change in mountainous regions such as Gilgit-Baltistan (GB) in the northern part of Pakistan has resulted in uneven vulnerabilities, and the marginal groups most affected by this change are women. These gender practices are best understood through the framework of Feminist Political Ecology (FPE), which examines how environmental governance is entwined with power relations related to gender, class, and local knowledge. FPE transcends simple victim narratives by emphasizing how women serve as environmental caretakers, decision-makers, and bearers of knowledge all the while, as we point out, often being marginalized from

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formal adaptation policies and climate-resilient planning (Rocheleau et al., 1996; Resurrección et al., 2019).

One of the first region-specific studies on this topic was reported by Gioli et al. (2014), who conducted a study on climate-related migration in Great Britain (GB). With climate variability, women had to increasingly provide additional labor, while men had to undertake migration for work. This "feminization of responsibility," however, did not necessarily mean a "feminization of power." They did not have the power to influence those design decisions. Women were left to cope with climate challenges with no opportunities for decision-making and no network of support in place. The study underscored how climate change affects and is affected by the reinforcement of patriarchal systems, thereby resulting in what Gioli et al. refer to as "gendered adaptation without empowerment." These results – tangled, nested causation provide strong evidence of the utility of FPE for examining the side effects of climate adaptation policies.

Habib (2021) further examines the gendered effects of livelihood disruption among agricultural communities in the Gilgit River basin. The area is prone to severe climate-induced events, such as flash floods and glacier lake outburst floods (GLOFs), which have a disparate impact on women's economic activities. Because GB women are deeply involved in subsistence farming, food insecurity among women arises from climate-induced crop failure, water scarcity, poor nutrition that leads to nutritional shortages, and the subsequent perpetuation of gendered poverty. "Often, it is passed down among women about how to respond to weather. Women are made to learn about the weather because they spend more time outside and have more dependence on the climate," Habin observes. However, most such knowledge remains unincorporated into disaster response considerations. The study supports FPE's fundamental thesis: women's ecological knowledge is marginalized in technocratic governance.

Likewise, Batool (2019) investigated how socio-environmental transitions in the upper Hunza Valley, such as changes in agrarian relationships and education, also reframed gender roles. Education and migration provided new opportunities for youth, but they also altered the traditional division of labor, especially in agricultural communities. Girls' education access was, in fact, a "double-edged" sword; it increased aspirations while often alienating students from the ecological labor that women engaged in. Batool's thesis juxtaposes the gendered generational changes to show that the FPE-related advancements fragment the narratives in the development paradigms advanced by climate adaptation and modernization efforts.

Ali, Iqbal, and Ali (2024), on the other hand, point out a second aspect of intersectionality by examining women's tourism entrepreneurship in the Hunza Valley. Vis-à-vis tourism opened up opportunities for women's economic participation; however, gendered cultural prescriptions limited their degree of mobility, public visibility, and integration within the formal credit system. Their analysis was based on a feminist intersectional lens to illustrate the role of class, geography, and religion in women's access to climate resilience through the tourism sector. Even when women achieved, their stories often got incorporated into development branding, with no change in the structural inequalities that permeate GB's social fabric. So, the eminently rational conclusion from the specific experiences of these Islamist women is that "empowerment" is a more complex phenomenon that takes into consideration the emotional labor and societal negotiations these women must navigate.

Gender also accounts for significant differences in climate change perceptions, as presented by Ali et al. (2025) in Nagar District. The research interviewed male and female farmers and

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discovered that women were twice as likely to cite water scarcity and three times more likely to mention food availability and health effects as top concerns compared to men, who identified infrastructure and loss of income. Although women perceived a higher risk of BE than men, they were less likely to have participated in local adaptation programs. The study recommends the inclusion of sex-disaggregated data in climate vulnerability assessments and calls for the decentralization of climate governance to capture the voices of women in adaptation policies.

Apart from empirical evidence, researchers such as Ali et al. (2019) have considered two decolonial and Indigenous feminist frameworks to interrogate this construction of environmental knowledge in GB. Based on case studies from the Ghizer Valley, the authors argue for a decolonial feminist praxis that accounts for local epistemologies—by way of communal resource sharing and seasonal migrations—which are often overlooked in mainstream conservation narratives. They argue that FPE in South Asia needs to step away from importing Global North frameworks and instead co-produce knowledge with local women, particularly indigenous and marginalized women.

The emotional and affective dimensions of climate work are problematized by Gomersall et al. (2023), who enrich the field of FPE by considering how rural women negotiate emotional stress and care loads in climate-induced disasters. Relying on ethnographic research in Pakistan's mountains, they argue that climate change not only disrupts ecosystems but also does emotional work, particularly care work and animal care, which is part of the price women pay for the recovery of ecosystems. Emotional and political ecology emerges, then, as a timely intervention in FPE and a new frontier for analyzing the gendered dimensions of affect, grief, and resilience.

The intersection of gender, infrastructure, and marginalization is sharp in the work of Dinar (2020), who observed how large-scale development and climate projects in GB, for example, around roads, dams, and tourist zones, regularly omit women from consultations and allocations. The implementation of infrastructure in GB has prioritized masculinized labor markets, even while it disrupts local ecosystems that women rely upon for food, medicines, and fuel. These patterns reinforce what FPE scholars name as "patriarchal environmentalism," the imposition of technocratic and masculinist logic to dominate the environment, often by sidelining women's informal but vital contributions to environmental care.

Finally, it is worth considering how the state in climate governance itself is gendered. As noted by Goodrich et al. (2019), government flood contingency plans and environmental reports in GB are usually written in a gender-neutral manner. This erasure obscures how policies have different effects on men and women. In addition, the lack of sex-disaggregated data hinders policy development. FPE scholars argue that these omissions are not merely accidental but reflect deeper epistemological biases that reside in science and governance systems, which value formal, male-centric knowledge over informal, embodied, and often women-centered ecological knowledge.

Martial and Methods

The study was conducted in the districts of Hunza, Ghizer, and Nagar in Gilgit-Baltistan, Pakistan, using a qualitative research design grounded in Feminist Political Ecology to explore the gendered dimensions of climate change. Data were collected through 30 in-depth semi-structured interviews with women engaged in agriculture and resource management, six focus group discussions (FGDs) across the three districts, and participant observations during daily ecological and community activities. Participants were selected purposively and through

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snowball sampling to ensure diverse representation across age, socioeconomic status, and geographic location. All interviews and FGDs were audio-recorded, transcribed, and analyzed thematically using NVivo software, combining inductive and deductive coding aligned with Feminist Political Ecology concepts such as gendered labor, traditional ecological knowledge, emotional burdens, adaptation strategies, and institutional dynamics. Ethical protocols were strictly followed, including informed consent, confidentiality, and culturally sensitive data collection practices, with female researchers conducting interviews to ensure participant comfort and openness

Conceptual framework

This Study employs a feminist political ecology (FPE) perspective to focus on the intersections of gender, power, labour, and ecological change (Rocheleau, Thomas-Slayter & Wangari, 1996). FPE challenges dominant environmental paradigms by demonstrating the disproportionate ways in which women bear the impacts of socio-environmental injustices while holding important traditional ecological knowledge (TEK) that is often sidelined in formal climate governance (Agarwal, 1992; Nightingale, 2011). The model recognises that the burden of women's unpaid work in farming, water management, and household maintenance is heightened by male outmigration related to climate change and resource scarcity (Djoudi et al., 2016). It also takes on board the idea of emotional labor, the mental and emotional toils linked to climate vulnerability that is gendered and mostly invisible (Sultana, 2011). Women's resistance strategies, such as diversification of crops and community cooperatives, can be viewed as everyday resistance and agency in contexts otherwise dominated by patriarchal norms and institutional exclusion (Arora-Jónsson, 2014; Nightingale, 2015). The conceptual framework situates gendered ecological knowledge, labor, emotional burdens, and agency within broader power relations, thereby providing a more holistic approach to appreciating and addressing the gendered aspects of climate change in the region.

Findings and Thematic Analysis

Theme: Gendered Labor and Resource Strain

Analysis revealed a marked intensification of women’s labor in response to environmental stressors. Over 70% of female respondents across all districts reported assuming primary responsibility for food production, livestock care, and irrigation due to male outmigration linked to climate-affected livelihoods.

“Since my husband left for Karachi due to crop failures, I now manage the barley field, feed the goats, and fetch water... alone.”
(Woman farmer, Nagar District)

This feminization of labor, however, did not coincide with increased decision-making power. Village-level institutions such as water user associations or agricultural committees remained male-dominated, perpetuating a disconnect between women's ecological work and institutional climate responses.

Theme: Traditional Ecological Knowledge (TEK)

Women consistently demonstrated high awareness of local climate signs, such as changing snow patterns, soil moisture, and medicinal plant cycles. In Ghizer, 9 of 10 women

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interviewed could recount intergenerational knowledge on planting cycles affected by glacial melt. However, this knowledge remained informal and excluded from scientific assessments.

"My mother taught me that if the snow melts by Nowruz, planting comes early. It's different now—we see floods even before that."
(Elderly woman in Ghizer)

The exclusion of TEK from formal environmental planning reinforces epistemic injustice—central to feminist political ecology critique—and undermines locally appropriate solutions.

Theme: Emotional and Care Burdens

Women described high levels of climate-induced anxiety and emotional stress, particularly related to food insecurity, children's health, and elder care. Emotional burdens were more pronounced among women who lacked male household support due to migration or death.

FGDs revealed that emotional labor (e.g., worrying, organizing food, caring for sick family) is gendered, unpaid, and invisible, yet directly linked to climate stress.

"I cannot sleep during rainy nights. I worry the flood will take our field again like it did two years ago."
(FGD participant, Hunza)

This emotional ecology dimension broadens conventional understandings of vulnerability by including mental health as a climate impact pathway.

Theme: Climate Risk Perception and Adaptation

Women's perception of climate risk was consistently high, especially in relation to water and food systems. However, adaptation strategies available to them were limited by social norms and access to assets (land, credit, mobility). While men migrated, women coped through crop diversification, home-based enterprises, or altering water-use patterns.

In Ghizer, some women shifted from water-intensive wheat to more drought-resilient legumes. In Hunza, several young women-initiated kitchen gardening cooperatives using rainwater harvesting, highlighting innovation in constrained contexts.

Adaptation decisions were highly localized, non-technical, and grounded in lived experience yet largely unsupported by government programs.

Theme: Agency, Resistance, and Institutional Invisibility

Despite structural limitations, women displayed remarkable forms of resistance and agency. Initiatives included self-organized savings groups, informal agricultural collectives, and climate education workshops. However, institutional support was absent.

"We applied for training on flood protection, but they said only male farmers could attend."
(Woman entrepreneur, Hunza)

Data show that state and NGO interventions in climate resilience are gender-blind, often replicating patriarchal biases in eligibility, language, and outreach strategies.

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Findings

Theme	Findings	Implication
Gendered Labor	Women bear climate burdens but are excluded from formal decisions.	Requires institutional gender mainstreaming.
Ecological Knowledge	Women hold rich local knowledge on climate cycles.	TEK integration essential for sustainable adaptation.
Emotional & Care Burdens	Climate anxiety and emotional labor are prevalent.	Emotional ecology must be factored into adaptation support frameworks.
Adaptation Responses	Women innovate under constraints (e.g., crop choices, water-saving).	Support local, non-technical adaptation via grants and training.
Agency and Institutional Gap	Women form cooperatives and resist exclusion.	Build inclusive climate governance and training programs.

From a feminist political ecology standpoint, these results confirm that environmental problems are not experienced equally and shared equitably. WOMEN IN GB WORKS ON THE FRONTLINE In GB, women are dealing with the harshest aspects of climate, and they are leading in taking action to adapt. However, their efforts are institutionally and culturally unseen and unvalued. Instead of presenting women as helpless victims, the analysis argues that women are resilient and knowledgeable agents. Resistant on a day-to-day basis within the context of broader structural inequalities. The findings further reveal the policy-practice gap; despite gender-sensitive rhetoric in Pakistan's northern climate programs, efforts are yet to be mindful of intersectional complexities that women are often not landholders, lack mobility, or have language barriers.

Discussion

This study highlights the importance of grounding the analysis of climate change impacts in Gilgit-Baltistan (GB) within a Feminist Political Ecology (FPE) framework. The data show a longstanding and often invisible gendered dichotomy in climate vulnerability and adaptation responses. Women in GB, as this study shows, are on the frontline of climate change – not just suffering its worst consequences but also adapting in creative, local, and knowledge-based knowledge-based ways. However, despite the importance of these roles, there is little institutional recognition or support, thereby reinforcing wider criticism in FPE that environmental governance reproduces patriarchal structures (Rocheleau et al., 1996; Nightingale, 2011). The gendered labor division in Hunza, Ghizer, and Nagar aligns with the global pattern, where male migration due to climate change leads to an increasing workload for female labor, both productive and reproductive (Gioli et al. Women are increasingly working on farms, managing water supplies and livestock, and providing care, but they typically lack access to land or control over financial resources. This unfurling of double accountability transformed neither divisions of authority nor voice, an expression of what feminist scholars' term "responsibilities without empowerment" (Arora-Jonsson, 2011). In the UK, this phenomenon is exacerbated by cultural norms that inhibit women's mobility and

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public exposure, thereby enabling them to access climate information and excluding them from institutional networks. Therefore, women's roles in local adaptation continue to be undervalued in policy discussions. Equally important is the revelation that women hold excellent traditional ecological knowledge (TEK), which holds the key to community resilience. Women surveyed from the study areas expressed a high level of sensitivity to climatic signals, including early snowmelt, glacial runoff, and early spring and late winter planting cycles, many of which they had inherited from their parents. This aligns with other research suggesting that women's Traditional Ecological Knowledge (TEK) is crucial and systematically suppressed in climate governance (Gaard, 2015; Sultana, 2021). However, this knowledge (for instance, on changing crop cycles, seed saving, or water conservation) is woefully lacking from government adaptation plans in GB or NGO programming, as they tend towards external and technocratic solutions.

The focus of the study on emotional and psychological labor extends the conventional understanding of what climate vulnerability is. Anxiety, sleeplessness, and emotional exhaustion in the context of threats of flooding, lack of fertile land, and resource-depleted care were commonly reported by women. This lends support to the nascent field of emotional and political ecology, which asserts that emotional experiences are not tangential but integral to understanding community responses to environmental change (Gomersall et al., 2023). These affective contours have a strongly gendered dimension, as women are more often than not the invisible bearers of emotional responsibility for the home, community, and future, maneuvering for survival in times of environmental instability. The study also charts resilience and agency among women, a challenge to the stereotype of "passive victims of violence. In all three villages, women established informal cooperatives, diversified their crops, and initiated small-scale, climate-resilient businesses, including composting, seed banking, and kitchen gardening. Unrecognized by formal institutions of governance, these adaptive practices are a form of silent environmental activism that is immanent in everyday life (Truelove, 2011). However, the GB institutions around adaptation, including disaster management, agricultural extension services, and district governments, are overwhelmingly dominated by men. This institutional invisibility reflects neo-colonial critiques of feminist environmentalism, in which power systems not only render women invisible but also determine what constitutes knowledge and whose knowledge counts (Haraway, 1988; Sultana, 2022).

Furthermore, Pakistan's national climate policies have gender-sensitive language, but the regional implementation is weak. Such a gap between national gender policy and local realities aligns with earlier studies, which suggest that gender mainstreaming and integration efforts across sectors often amount to mere rhetoric without a grasp of the contextual, intersectional realities at the local level (Ribot, 2014; Resurrección et al., 2019). In GB, where language, ethnicity, sectarian identity, and distance also mediate women's experiences, a monolithic view of gender and climate obscures the convergence among these; a one-size-fits-all does not take into account this overlapping layer of vulnerabilities.

Notably, the research confirms that a focus on intersectionality is crucial to feminist political ecology, particularly in the context of women's Experiences of Climate Change in the UK. The experiences of women with climate change in GB are influenced by their gender, as well as their age, marital status, religion, education, and geographical location. Single or widowed women, for example, experienced greater economic vulnerability, and younger, educated women—predominantly from Hunza—were more likely to practice entrepreneurial adaptation. This presents a mirror image of the central claim of Crenshaw (1991): its instrumental response to inequality must allow for the intersection of power, not simply adding "women" into the old

models. This work also contributes to discussions on decolonizing climate knowledge. Some expressed frustration that government or NGO initiatives were conceived in Islamabad or abroad and then implemented without local consultation. Building on the work of scholars such as Escobar (2008), the study endorses calls for the co-production of climate knowledge in a manner that recognizes the local population, especially women, as equally epistemic and not merely passive partners.

Conclusion

This study concludes that the impacts of climate change in Gilgit-Baltistan are profoundly gendered, with women bearing a disproportionate share of environmental, emotional, and economic burdens while remaining largely excluded from formal decision-making processes. Through the lens of Feminist Political Ecology, the research reveals that while women in mountain communities are key actors in sustaining agricultural systems, managing water resources, and preserving ecological knowledge, their voices are often silenced in mainstream climate adaptation and governance structures. The data illustrate a complex reality: women are not merely passive victims of climate crises but active agents of resilience, innovation, and informal adaptation. Yet, their efforts remain unsupported by policies that continue to operate through patriarchal and technocratic frameworks. For climate adaptation in Gilgit-Baltistan to be effective, inclusive, and just, there is an urgent need to embed gender-transformative approaches that recognize, resource, and elevate women's environmental labor and knowledge. Ultimately, addressing the gendered dimensions of climate change is not only a matter of equity but also of ecological sustainability and regional resilience.

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