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Impact of Climate Change on Natural Resource Distribution and Social Inequality

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ABSTRACT

Climate change has emerged as one of the most pressing global challenges of the twenty-first century, affecting not only environmental systems but also social and economic structures. This study aimed to examine the impacts of climate change on natural resource distribution and social inequality. We conducted this research by using qualitative research method and exploratory research approach. We interviewed 14 persons from Gilgit Baltistan (GB) with the help of interview guide and snowball sampling. We used thematic analysis to analyse the data. The findings revealed climate change disrupts resources like water and land, worsening inequalities for vulnerable groups such as small farmers and women. This sparks food insecurity and migration, despite resilient adaptations. Policymakers must enable sustainable governance, local capacities, and equitable access, embedding social justice in climate action for resilient, inclusive development.

Keywords: Climate change, Natural resources, Inequality, Land, Erosion

Introduction

Climate change has emerged as one of the most pressing global challenges of the twenty-first century, affecting not only environmental systems but also social and economic structures (Hernández & Breña, 2016). Rising global temperatures, erratic rainfall patterns, increasing frequency of extreme weather events, and gradual environmental degradation are transforming the availability and distribution of natural

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resources across the world (Kushawaha, Borra, Kushawaha, Singh, & Singh, 2021). Resources such as water, fertile land, forests, and biodiversity form the foundation of human livelihoods, particularly in rural and agrarian societies (Ahmed, Khan, & Augustine, 2018). However, climate change disrupts these ecological systems, creating scarcity and altering traditional patterns of resource access and utilization (Upadhyay, 2020). Scholars argue that climate change is not merely an environmental problem; it is deeply intertwined with issues of development, governance, and social justice (Loucks, 2021; Mehta, 2024). As environmental changes intensify, the uneven distribution of natural resources becomes more visible, raising concerns about who controls these resources and who bears the consequences of their depletion.

The rationale for examining the impact of climate change on natural resource distribution and social inequality is particularly significant in the context of Pakistan and Gilgit Baltistan (GB). Pakistan is widely recognized as one of the countries most vulnerable to climate change due to its geographic location, dependence on agriculture, and limited adaptive capacity (Fahad & Wang, 2020; Nadeem, Jacobs, & Cordell, 2024). Changing rainfall patterns, glacial melting in the Himalayas, floods, droughts, and increasing temperatures are already affecting the availability of essential natural resources such as water, fertile land, and forests (Arshed, Saeed, Salem, Hanif, & Abbas, 2024). Regions such as AJK and GB, which are characterized by mountainous terrain and rural livelihoods, are especially sensitive to these environmental changes (Ali, Shedayi, Khan, & Shafaqat, 2024). Local communities in these areas depend heavily on agriculture, livestock, and forest resources for their survival, making them particularly vulnerable to climate-induced resource scarcity (I. Ali, Shah, Alotaibi, & Ali, 2024). Environmental disruptions often intensify existing social inequalities, as marginalized groups—such as small farmers, landless laborers, and women—have limited access to resources and fewer opportunities to adapt to environmental stress. As highlighted by Aslam, Hayat, Pari, Sameen, and Ahmed (2023) climate change not only threatens ecosystems but also exacerbates social and economic disparities in vulnerable regions. Therefore, studying the relationship between climate change, resource distribution, and social inequality in GB is crucial for understanding how environmental challenges intersect with social structures and for developing policies that promote both environmental sustainability and social equity. This study was guided by the following objectives.

To examine how climate change affects the availability and distribution of natural resources in vulnerable communities.

To analyse how unequal access to these climate-affected natural resources contributes to social and economic inequalities among different social groups.

Literature Review

The impacts of climate change are particularly evident in the changing availability of essential natural resources (Kushawaha et al., 2021). Water scarcity, declining soil fertility, desertification, and deforestation are increasingly observed in many regions, especially in developing countries where communities rely heavily on natural ecosystems for their survival (Maja & Ayano, 2021). For example, irregular rainfall and prolonged droughts reduce agricultural productivity and limit water supplies, while floods and storms can damage land and forests. Ali and Kamraju (2023) stated

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that climate change significantly influences the hydrological cycle, leading to unpredictable water distribution and increased competition over limited resources. These environmental changes disproportionately affect communities that depend on subsistence farming, pastoralism, or forest-based livelihoods (Pörtner et al., 2022). As a result, climate change reshapes patterns of resource availability and creates new forms of environmental vulnerability, particularly among populations that already face economic or geographic disadvantages.

From a sociological perspective, the issue of natural resource distribution cannot be separated from existing social inequalities (Malin, Ryder, & Lyra, 2019). Rees (2017) revealed that access to resources such as land, water, and forests is often structured by social hierarchies related to class, gender, ethnicity, and geographic location. Climate change intensifies these inequalities by amplifying resource scarcity and increasing competition among different social groups (Islam & Winkel, 2017). Wealthier individuals and communities typically possess greater adaptive capacity, including financial resources, technology, and institutional support, enabling them to mitigate or adapt to environmental changes more effectively (Cinner et al., 2018). In contrast, marginalized populations frequently lack such resources and therefore experience the most severe consequences of climate-related disruptions. As noted by Mortreux and Barnett (2017) of the "risk society," modern environmental risks are often unevenly distributed, with vulnerable populations bearing disproportionate burdens despite contributing least to environmental degradation.

The relationship between climate change and social inequality is further explained through the framework of environmental justice (Marí-Dell'Olmo et al., 2022). Environmental justice scholars emphasize that environmental risks and resource shortages are not randomly distributed but are shaped by political and economic power relations (Abi Deivanayagam et al., 2023). Climate change can deepen existing inequalities when powerful actors gain control over scarce resources while marginalized communities lose access to them. For instance, reduced water availability may lead to conflicts between agricultural, industrial, and domestic users, while land degradation may push small farmers and pastoralists into poverty or displacement. Similarly, Islam and Winkel (2017) argued that deforestation and changing forest ecosystems can undermine the livelihoods of indigenous and forest-dependent communities. These processes demonstrate how environmental transformations intersect with social structures, reinforcing patterns of inequality and exclusion.

Understanding the impact of climate change on natural resource distribution is therefore crucial for addressing broader issues of social and economic inequality (Asiedu, Amidu, & Halidu, 2024). As climate pressures reshape ecosystems, they also reshape patterns of livelihood, migration, and social relations (Khan, Srivastava, Mazhar, & Khan, 2026). Communities that depend directly on natural resources are often the first to experience these transformations, highlighting the need for policies that integrate environmental sustainability with social equity (Feng et al., 2023). This study aims to examine how climate change affects the availability and distribution of key natural resources such as water, land, and forests within vulnerable communities. Furthermore, it seeks to analyse how unequal access to these climate-affected resources contributes to widening social and economic inequalities among different

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social groups. By exploring these interconnected dynamics, the study contributes to a deeper sociological understanding of climate change as both an environmental and social challenge.

Methodology

This study employed a qualitative research design to explore the lived experiences and perceptions of climate change impacts on natural resource availability and community vulnerabilities. A phenomenological approach was adopted to capture in-depth insights from participants directly affected by climatic shifts, emphasizing subjective interpretations over quantitative metrics.

Sampling Strategy

Purposive sampling was utilized to select 14 participants from vulnerable communities in GB, ensuring representation of diverse demographics including small farmers, landless laborers, women, and community elders. Inclusion criteria focused on individuals with at least five years of direct reliance on natural resources and observed climate-induced changes. Snowball sampling supplemented initial recruits, identified through local NGOs, to access hard-to-reach voices. This non-probability method prioritized information-rich cases, yielding a sample size deemed sufficient for thematic saturation, as confirmed post-analysis.

Data Collection

Semi-structured interviews, lasting 45-60 minutes each, were conducted in participants' preferred language (e.g., English, Urdu, Balti and Shina) between June-August 2024. An interview guide structured the process with open-ended questions probing themes like resource scarcity experiences, adaptation strategies, and inequality perceptions. Probes ensured depth, while audio recordings (with consent) and contemporaneous notes preserved data integrity. Ethical considerations included informed consent, anonymity, and voluntary participation, approved by district administration of Gilgit.

Data Analysis

Thematic analysis, following Braun and Clarke's (2006) six-phase framework. We transcribed the data and allocated initial codes emerged inductively, followed by theme generation, review, definition, and reporting. Trustworthiness was enhanced through member checking, peer debriefing, and reflexive journaling to mitigate researcher bias.

Key Findings

Thematic analysis was employed to systematically identify, analyse, and interpret patterns of shared meaning within the qualitative dataset. This inductive approach allowed key themes to emerge directly from the data, ensuring findings remained grounded in participants' perspectives. The following section outlines the key findings, organized by overarching themes with supporting extracts.

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Changing Patterns of Natural Resource Availability

The findings reveal that local communities increasingly perceive significant changes in the availability and distribution of natural resources due to shifting climatic conditions. Participants frequently described irregular rainfall, rising temperatures, and extreme weather events as major factors affecting the natural environment and the resources upon which their livelihoods depend. These changes have altered traditional ecological cycles that communities previously relied upon for agriculture, water supply, and forest-based activities. Many respondents explained that seasonal patterns, which were once predictable, have become uncertain, making farming and other resource-dependent practices more difficult to manage.

Water scarcity emerged as a major concern among participants. Several community members reported that springs, streams, and small water channels that once supplied water throughout the year now dry up during certain months. A middle-aged farmer explained, “In the past, our village streams flowed even during the summer, but now the water level decreases quickly because rainfall has become unpredictable.” Similarly, respondents highlighted that delayed or insufficient rainfall directly affects crop cultivation and irrigation practices. A farmer noted, “Our crops depend on rain, but now the rain comes late or sometimes too heavy, which damages the fields instead of helping them.”

Participants also discussed noticeable changes in the quality and productivity of agricultural land. Soil erosion, declining soil fertility, and frequent flooding were reported as factors reducing crop yields and agricultural productivity. One respondent shared, “The land used to produce enough wheat and maize for our families, but now the soil has become weak, and the harvest is smaller each year.” Alongside agricultural challenges, forest resources were also reported to be under stress due to changing climatic conditions and environmental degradation. Some participants observed that forest cover has declined and certain forest products have become harder to obtain.

Overall, these experiences highlight how climate change is reshaping local ecosystems and altering the distribution of essential natural resources. Such environmental transformations not only disrupt traditional livelihood practices but also increase the vulnerability of communities that depend heavily on natural resources for their survival.

Unequal Access and Control over Natural Resources

The findings indicate that climate change not only affects the availability of natural resources but also deepens existing inequalities in access and control over these resources. Participants reported that resources such as water, agricultural land, and forest products are not equally accessible to all members of the community. Instead, access is often shaped by social and economic factors including land ownership, wealth, gender roles, and local power structures. As climate change intensifies resource scarcity, these inequalities become more visible, with powerful groups maintaining greater control over limited resources while marginalized households face increasing restrictions.

Land ownership emerged as a significant factor influencing access to natural resources. Participants explained that families who own larger or more fertile

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landholdings are better able to cope with changing environmental conditions because they have greater control over irrigation sources and productive land. In contrast, small farmers and landless households often depend on shared or rented land, making them more vulnerable to climate-related disruptions. One participant stated, "Those who have more land and their own water sources can still grow crops, but people like us who depend on others struggle when water becomes scarce."

Gender also played a crucial role in shaping access to natural resources. Female participants reported that although women are actively involved in agricultural work, fuel collection, and water management, they rarely have ownership rights over land or decision-making authority regarding resource use. A woman from the community explained, "We work in the fields and collect firewood from the forest, but the land and decisions belong to men."

Livelihood Vulnerability and Socio-Economic Consequences

The findings show that climate-induced scarcity of natural resources has significantly increased livelihood vulnerability among local communities. Participants explained that changes in rainfall patterns, water shortages, and declining soil fertility have directly affected agricultural productivity, which remains the primary source of income for many households. As crop yields decrease and farming becomes less reliable, families experience growing economic insecurity and struggle to meet their basic needs. For small farmers and laborers who depend heavily on natural resources, these environmental changes have intensified financial instability and uncertainty about the future.

Many respondents reported that declining agricultural output has reduced household income and increased food insecurity. A farmer explained, "Our crops used to support the whole family for the year, but now the harvest is much smaller because the weather is not the same." Another participant shared that unpredictable rainfall and drought conditions have forced some families to purchase food from markets rather than rely on their own production, which places an additional financial burden on already vulnerable households. As one respondent noted, "When the crops fail, we have to buy wheat and vegetables from the market, and prices are high for people like us."

Participants also described how the loss of forest resources and grazing land has affected livestock rearing and other supplementary sources of livelihood. Reduced availability of fodder and forest products limits opportunities for income generation and household consumption. Some respondents explained that these economic pressures have forced younger members of the community to migrate to urban areas in search of employment. One participant stated, "Many young men leave the village to work in cities because farming alone cannot support the family anymore."

Overall, these experiences demonstrate that climate-related resource scarcity has far-reaching socio-economic consequences. Poorer households, small farmers, and resource-dependent communities face greater livelihood vulnerability because they possess limited financial resources, fewer alternative income opportunities, and weaker coping mechanisms to adapt to changing environmental conditions.

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Community Adaptation and Coping Strategies

The findings indicate that communities actively adopt various adaptation and coping strategies to manage the challenges created by climate change and the resulting scarcity of natural resources. Participants explained that environmental uncertainties have compelled them to modify traditional livelihood practices, particularly in agriculture and water management. Farmers reported adjusting cropping patterns, planting more drought-resistant crops, and altering sowing times to cope with unpredictable rainfall and temperature changes. These adaptive practices reflect local knowledge and community efforts to reduce the risks associated with changing climatic conditions. As one farmer explained, "Earlier we used to grow the same crops every year, but now we try different crops that can survive with less water."

Water management strategies were also frequently mentioned as an important response to climate-related challenges. Participants described efforts such as storing rainwater, repairing irrigation channels, and using water more carefully during dry periods. In some villages, community members cooperate to distribute water more fairly among households and farms. A respondent noted, "When water becomes scarce, we try to share it among farmers so that everyone can irrigate their fields at least once." Such collective practices demonstrate how community cooperation can help reduce the negative impacts of resource scarcity.

Migration was another strategy discussed by participants, particularly among younger members of households. Due to declining agricultural productivity and limited local employment opportunities, some individuals temporarily migrate to nearby cities to earn income and support their families. One participant explained, "My sons work in the city for a few months every year because farming alone cannot meet our expenses."

Participants also highlighted the role of government support, local institutions, and social networks in strengthening adaptation efforts. However, some respondents expressed concern about limited access to institutional assistance and climate-related information. Overall, these experiences illustrate that while communities attempt to adapt through local knowledge, cooperation, and livelihood diversification, their capacity to cope with climate challenges remains influenced by broader social and institutional support systems.

Discussion

This study reveals the intricate nexus of climate change, natural resource distribution, and social inequality in vulnerable communities. As Ahmed and Augustine (2018) observed, shifting climates—marked by irregular rainfall, soaring temperatures, and extreme events—have eroded the reliability of water, arable land, and forests, dismantling ecological cycles rural households once relied on for farming and livelihoods (Fahad & Wang, 2020). These disruptions mirror patterns in developing regions, where climate stressors intensify pressure on water systems, soil fertility, and forest ecosystems essential for survival (Ali & Kamraju, 2023).

Critically, these changes exacerbate inequities. Access to dwindling resources hinges on entrenched hierarchies of land ownership, wealth, and gender, sidelining small farmers, landless households, and women while empowering elite landowners (Islam & Winkel, 2017; Loucks, 2021). Maja and Ayano (2021) underscore this disparity:

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environmental risks disproportionately burden marginalized groups, amplifying vulnerability during scarcity.

Such scarcity triggers cascading socio-economic fallout. Declining agricultural output, forest losses, and water deficits fuel income instability, food insecurity, and dependence on volatile external markets (Mortreux & Barnett, 2017). Yet communities demonstrate remarkable resilience through adaptive strategies like diversified cropping, communal resource sharing, and seasonal migration—strategies rooted in local knowledge to navigate uncertainty (Rees, 2017).

In essence, climate change transcends ecology, weaving social and economic threads that deepen divides. Integrated policies are imperative: blending robust adaptation measures, equitable resource governance, and targeted institutional support to empower the vulnerable. By prioritizing justice in climate action, societies can foster resilient, inclusive pathways amid environmental flux.

Conclusion

In conclusion, this study underscores the profound repercussions of climate change on natural resource availability and distribution, exacerbating social and economic inequalities in vulnerable communities. Altered climatic patterns—such as erratic rainfall, escalating temperatures, and frequent extreme events—have destabilized ecological systems, curtailing access to vital resources like water, arable land, and forests. This disruption undermines agricultural viability and livelihoods, disproportionately burdening marginalized groups, including small farmers, landless households, and women, whose limited ownership and gender-based barriers amplify inequities. The ensuing resource scarcity fuels food insecurity, diminished productivity, and economic precarity, compelling communities to deploy adaptive measures like modified farming, resource sharing, and migration. While these strategies reflect remarkable resilience and indigenous wisdom, their sustainability hinges on robust institutional backing. To mitigate these challenges, policymakers must prioritize integrated interventions: fostering sustainable resource governance, bolstering local adaptation capabilities, and enforcing equitable access mechanisms. By embedding social justice into climate action, societies can not only safeguard vulnerable populations but also forge pathways toward resilient, inclusive development amid a changing climate. Ultimately, equitable resource stewardship is imperative to avert deepening divides and secure a just future for all.

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