*Contemporary Issues in Social Sciences and Management Practices (CISSMP)*
**ISSN: 2959-1023**
**Volume 4, Issue 4, December 2025, Pages 346-359**
**Journal DOI: 10.61503**
**Journal Homepage: https://www.cissmp.com**

# Negotiating Climate Vulnerability: A Sociological Exploration of WASH Inequalities and Community Adaptation Strategies in Climate-Stressed Rural Settlements

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***Article History:***
Received: Aug 10, 2025
Revised: Sep 11, 2025
Accepted: Oct 18, 2025
Available Online: Dec 30, 2025

***Keywords:*** Negotiating Climate Vulnerability, Sociological Exploration, WASH Inequalities and Community, Adaptation Strategies

***Funding:***
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## ABSTRACT

Climate change has significantly intensified challenges related to water, sanitation, and hygiene (WASH) in rural communities, particularly in regions already affected by poverty, social exclusion, and inadequate infrastructure. This qualitative study explored how climate vulnerability intersects with social inequality to shape unequal access to WASH services in climate-stressed rural settlements. Using in-depth interviews, focus group discussions, and community narratives, the study examined the lived experiences of households facing water scarcity, sanitation insecurity, droughts, floods, and declining environmental resources. The findings revealed that marginalized groups, particularly low-income households, women, and geographically isolated communities, experienced disproportionate WASH-related hardships during climate stress.. Despite limited resources, strong social networks and community cooperation played a critical role in supporting local adaptation efforts. However, the findings indicated that many adaptation practices remained temporary and insufficient without long-term policy support and inclusive governance mechanisms. The study concludes that addressing WASH inequalities in climate-vulnerable rural settlements requires socially inclusive, community-centered, and climate-responsive governance approaches that prioritize equity, resilience, and sustainable rural development.



**Corresponding Author's Email:** saadatalisaeedi@gmail.com
**DOI:** https://doi.org/10.61503/cissmp.v4i4.400
**Citation:** Yaseen, F., Ali, S., & Iftikhar, T. (2025 Negotiating Climate Vulnerability: A Sociological Exploration of WASH Inequalities and Community Adaptation Strategies in Climate-Stressed Rural Settlements. *Contemporary Issues in Social Sciences and Management Practices*, 4(4), 346-359.

## 1.0 Introduction

The issue of climate change has become one of the most acute international issues of the twenty-first century with an unequal distribution of vulnerable rural population where the lives and even existence depend on natural or environmental resources. In most of the developing world, droughts, floods, unpredictable rainfall, increased temperatures, and environmental erosion have aggravated the strains on already precarious water, sanitation, and hygiene (WASH) systems. Rural settlements under chronic climate stress frequently have acute clean drinking water deficits, declining sanitation facilities, and increased chances of having water-borne illness, leading to multidimensional social and communal wellbeing emergencies (Kamau, 2025). Their susceptibility is also enhanced by structural poverty, poor intervention by the state, poor institutional capacity and unequal allocation of environmental resources. Climate change in numerous rural settings is no longer understood as a simple phenomenon in the environment but as a fundamentally social phenomenon that transforms the inequality, exclusion and daily survival patterns. As a result, it has become one of the most relevant sociological and developmental issues of interest because of the interplay of climate vulnerability and WASH insecurity is especially significant in the areas where marginalized groups continue to be systematically deprived of their basic infrastructure and social protection systems (Alvi, Anwar, Ullah, and Afzal, 2025).

Climate vulnerability is a term that describes how vulnerable and exposed individuals or communities are to climate-related risks along with the low adaptability of coping with environmental alterations. In the climate-stressed rural settlements, vulnerability is not solely influenced by the exposure to ecological factors but also by socioeconomic disparities, political discrimination and limited access to institutional resources. At the same time, WASH inequalities are disproportionate access to both safe water, sanitation facilities, and hygienic conditions among various social groups and geographical regions (Organization, 2025). These disparities tend to manifest along convergent lines of social exclusion, gender, class, and geography, disproportionately impacting women, children, low-income households and remote communities. Climate stress enhances these disparities by decreasing the water supplies, destroying sanitation, polluting water bodies, and intensifying competition over limited environmental resources. With increasing environmental pressures, the rural people have to bargain survival by resorting to informal and localized coping strategies, thus turning the issue of WASH access into a more social justice-environmental inequality-human dignity concern (Nyathi, Mlambo, and Ndlovu, 2025).

The interplay between climate vulnerability and WASH inequalities may be explained in terms of sociological approaches where environmental risks and resources are unequally distributed in society. The theory of environmental inequality explains that the socially disadvantaged groups tend to be more exposed to environmental risks but have less financial and institutional resources to cushion them against the risk. On the same note, the Sustainable Livelihoods Framework emphasizes the effect of climate disruptions on the asset base and adaptive capacity of rural households, which minimizes their capacity to access fundamental services like water and sanitation (Gusha, Mhuru, Chitengedza, Sabarinath, & Ramesh, 2026). All these theoretical lenses imply that the WASH issues linked to climate are not just technical or

infrastructural issues but are rooted in broader regimes of power, inequality, and governance failure. Social communities experiencing climate stress tend to establish and use locally based adaptation strategies based on local knowledge, social action and indigenous practices, which have shown that resilience is a socially constructed process that occurs through networks of cooperation and mutual survival. The success of these adaptation efforts, however, is largely determined by the presence of institutional support, fair policy frameworks and inclusive systems of governance that are able to combat structural inequalities (Adhikari & Ghimire, 2025).

The current body of research on climate change and WASH has mostly addressed the environmental management, technical adaptation strategies, and the health outcomes of the public, and has not paid much attention to the sociological facets of WASH inequalities in climate-prone rural settings. Numerous past studies have focused on water scarcity, sanitation shortages, climate resistance in policy-based or quantitative terms, frequently ignoring lived experiences, social histories, and locus-specific coping strategies of marginalized rural communities. In addition, there are few studies that examined the intersection of social exclusion, poverty, gender inequality, and weak governance with climate vulnerability to define unequal access to WASH services (Tandon, Wallace, Caretta, Vij, & Irvine, 2024). This lack of community-based qualitative studies has left a glaring gap in the knowledge of how rural communities are able to negotiate environmental adversity in their daily lives and how informal systems of adaptation can arise in circumstances of institutional ineffectiveness. This disparity is especially evident in the developing countries where climate stress only exacerbates socioeconomic inequalities and environmental insecurities (P. K. Adom, 2024).

The research issue presented in this paper is thus the long-standing and disproportionate WASH insecurity of climate-sensitive rural populations, and the lack of knowledge on how the latter respond to environmental pressures in the realms of social disparities and constrained governance. Although the world is becoming increasingly concerned about climate resilience and sustainable development, most rural settlements still face persistent water supply shortages, inadequate sanitation facilities, and hygiene services when a climate crisis strikes (Sesay and Osborne, 2025). The current policy reactions often focus on infrastructural interventions without sufficiently taking into account the social realities, cultural practices, and community-based adaptation mechanisms that influence the local resilience processes. Consequently, the marginalized ones continue to be disproportionately vulnerable to environmental hazards and health risks, and local adaptations tend to be poorly-supported, fragmented, and unsustainable over time. To tackle this issue, a more sociological discussion of the intersection of climate vulnerability and WASH inequalities in the context of everyday rural life and the role of socially constructed adaptation practices in the survival and resilience of communities is necessary (Rao, 2025).

This research is important because it helps to advance sociological knowledge on climate-induced WASH disparities using a community-based and qualitative approach. The study provides important insights into how environmental change intersects with poverty, social exclusion, gender inequalities, and institutional inefficiencies through consideration of the lived conditions of climate-stressed rural people, which present an unequal access to vital WASH services. The paper

also adds to theoretical deliberations about environmental inequality, resilience, and community adaptation by showing how local knowledge systems and shared social networks are significant survival strategies in the face of climate stress (Letsyo, 2025). Policy-wise, the results offer useful policy insights to governments, development organizations, and non-governmental organizations that may wish to develop inclusive, climate sensitive, and equity-based WASH interventions in vulnerable rural areas. Furthermore, the paper highlights the significance of the local engagement, indigenous adaptation strategies, and socially inclusive governance in climate resilience plans to guarantee sustainable rural growth and environmental fairness amidst the growing climate pressures.

## 2.0 Literature Review

The proposed theoretical framework of the study is based on Environmental Inequality Theory and Sustainable Livelihoods Framework that offer a sociological approach to the context of interaction between climate vulnerability and WASH inequalities in a marginalized rural setting. Environmental Inequality Theory holds that ecological risks and resource insecurities occur unevenly in the society, and socially disadvantaged groups have a higher exposure to ecological hazards and less institutional and economic resources to manage these hazards (Rana and Saini, 2025). In rural settlements with high stress levels of climate, poor families and women and geographically isolated communities are many times left with heavy responsibility as to water scarcity and insecurity of sanitation, and poor hygiene conditions owing to unequal access to infrastructure and governance structures. At the same time, the Sustainable Livelihoods Framework illuminates how rural households depend on social, environmental, and economic assets that are interconnected to survive, and how climate disturbances undermine these livelihood resources and adaptive abilities to a large degree. The framework also indicates that access to institutional support, social networks and local coping mechanisms resilience and adaptation, which means that climate vulnerability is not necessarily a condition of the environment, but it is a phenomenon that is socially constructed and determined by poverty, exclusion, and the political systems. These theoretical approaches collectively define that climate stress, socioeconomic marginalization and low adaptive capacity are interacting factors leading to the emergence of WASH inequalities, and community-based adaptation practices serve as resilience mechanisms that exist socially (Abrams, Carden, Teta, and Wagsathere, 2021).

Recent empirical studies are increasingly appreciating the fact that climate change has compounded vulnerabilities in rural communities as it deteriorates access to safe water, sanitation and environmental resources. Research carried out in Pakistan, where floods and climatic conditions are prone to occur, indicates that multidimensional poverty relates strongly with climate vulnerability especially among households that have poor social protections and lack adequate livelihood resources. Studies also reveal that the hazards brought about by climate like floods, drought and inappropriate rain patterns cause severe damage to rural infrastructures, pollute water sources, and exert high sanitation insecurity on the marginalized groups (Ali, Pham and Xuan, 2025). Likewise, the findings in climate-sensitive regions of Punjab, Pakistan show that low adaptive capacity rural households are more stressed by the environment and less resilient because

of poor institutional support and lack of resources. Available literature also emphasises that women and low income families are disproportionately affected by the impact of climate change since gender disparities, limited mobility, and economic insecurity expose them to water insecurity and sanitation issues when environmental disasters strike. All these findings add up to the conclusion that climate vulnerability works via interplaying social and environmental inequalities that exacerbate WASH insecurity among the already vulnerable rural communities (Abrams et al., 2021).

The literature also highlights that climate stress does not only pose a threat to physical infrastructure but also the social and livelihood systems, on which rural populations rely. Research on rural adaptation in Pakistan has documented that climate change has had devastating impacts on agriculture, household income security and natural resource accessibility thus lowering the capacity of the communities to sustain the appropriate WASH statuses and healthy living standards. The studies on livelihood adaptation strategies reveal that households tend to react to climate stress by diversifying their livelihoods, informally sharing resources, migration, and engaging in collective action practices to reduce environmental risks and ensure household survival (Dormal, 2025). Equally, community-based adaptation studies indicate that community action groups and local collaboration have a profound positive impact on resilience through collective access to resources, exchange of indigenous knowledge and community-based systems of support during climate-related disasters. The adaptive responses provide evidence that resilience in vulnerable rural settlements to climate change is socially built by the networks of trust, reciprocity, and local involvement rather than the formal government interventions. Nevertheless, researchers also postulate that these informal adaptation processes are sometimes not enough and short-term in the case of no long-term policy support, institutional coordination, and inclusive climate governance frameworks that can help mitigate structural inequalities (Alcantara-Ayala, Velasquez-Espinoza, and de Jesu, 2025).

Within the wider WASH literature, researchers have begun to recognize that climate change is becoming a significant risk to a sustainable sanitation and hygiene system, especially in the highly vulnerable rural context. Studies carried in the developing world in climate sensitive rural areas show that floods, droughts and environmental damages have adverse impacts on the sanitation infrastructure, hygiene behaviors, water quality and health outcomes of the household. The literature also indicates that the effects of climate are disproportionately affecting social groups, with marginalized populations facing more obstacles to accessing and maintaining sanitation and recovering after climate shocks (Wong, Hoang, Ferrara, and Nguyen, 2025). Empirical research looking at lived experience of climate-induced sanitation burdens suggests that households tend to resort to informal coping strategies, such as water storage strategies, makeshift sanitation systems, and shared support networks to overcome environmental adversity. Nonetheless, scholars note that in most rural settings, climate-responsive WASH policies have not been developed yet due to the predominance of technical solutions at the policy levels with little focus on the social aspects of inequality, vulnerability, and local adaptation capacities. Therefore, the poor governance frameworks and low levels of institutional responsiveness remain to

undermine the sustainability of rural WASH systems in the long run faced with a climate stress (Matimolane & Mathivha, 2025).

Although the literature on climate vulnerability, adaptation and rural resilience is increasing, there are still gaps in the knowledge relating to the sociological aspect of WASH inequalities among climate-stressed rural settlements. Much of the research that has been done has focused on the environmental assessment, disaster management, agricultural adaptation, or quantitative measures of vulnerability, with relatively little focus on what it is like to live under climate stress and social reality negotiating unequal access to water and sanitation. In addition, most of the past researches have viewed climate vulnerability and WASH issues as distinct developmental issues, thus failing to recognize the interrelationship between the environmental change, social exclusion, and daily survival practices (Mashiyi, 2025). This low supply of qualitative and community-based studies has hampered insights on how local people perceive, negotiate, and respond to climate-related WASH insecurity by using indigenous knowledge systems and communal social action. In addition, there has not been enough academic focus on the analysis of how failures in governance, institutional imbalances and unequal distribution of resources exacerbate WASH-related vulnerability of marginalized rural communities. It is thus important to fill these gaps to ensure the creation of more inclusive, socially responsive, and climate sensitive strategies of rural development and environmental governance (Adom, Malivhadza, and Simatele, 2025).

The hypotheses in the study are that climate vulnerability has a significant effect on WASH inequalities in rural settlements by heightening environmental stress, resource shortage and infrastructural insecurity. The paper also hypothesizes that socially marginalized populations have disproportionately more WASH-related suffering in times of climate crisis because of disparities in resource access (as well as institutional support and adaptive capacity). Also, the literature indicates that the community adaptation strategies, such as the collective action, indigenous coping, and social cooperation, are relevant in enhancing the local resilience and reducing the adverse impacts of the climate-induced WASH insecurity (Ayompe & Epie, 2025). As such, the research formulates the following hypotheses: Climate vulnerability is a significant contributor of WASH inequalities in climate-stressed rural settlements; social inequality is a significant contributor of the relationship existing between climate vulnerability and WASH insecurity; and community-based adaptation measures is a significant contributor of resilience-building and coping capacity in climate-vulnerable rural communities.

## 3.0 Methodology

The project employed a qualitative research study as guided by researchers (Ahmad et al., 2026; Asim et al., 2021) to test the relationship between a climatic vulnerability, social inequality and water, sanitation and hygiene (WASH) challenges in climatic stressed rural settlements. Qualitative design was deemed suitable since the research sought to comprehend the lived experiences and perceptions coupled with practices of adaptation by communities under strain of the environment due to climate changes. The research, which is informed by an interpretivist approach, is focusing on the negotiated poverty and marginalization-driven socially negotiated

water scarcity, sanitation insecurity, floods, droughts, and diminishing environmental resources. The study was conducted in rural villages where climate related disruptions were prevalent, there were poor WASH systems and institutional inefficiency. They were particularly selected communities because they represented some of the most susceptible communities where the environment and social inequalities were met the most (Ahmad et al., 2026). The study particularly focused on marginalized households, women with the household management of water, low-income households, and geographically-isolated inhabitants who were at times disproportionately affected by WASH-related sufferings during times of climatic stress.

The participants were selected through purposive and snowball sampling techniques, as desired to get individuals with firsthand experience as far as climate vulnerability and WASH inequalities were concerned. The sample included rural residents from the South Punjab districts of Multan, Bahawalpur, Dera Ghazi Khan, Muzaffargarh, and Rajanpur, including household members, community elders, local leaders, and individuals actively involved in community development and social change initiatives. In-depth interviews, focus group discussions and informal community stories were used to gather data to provide detailed information on household coping mechanisms, local attitudes and community reactions to environmental issues. Access to safe water, sanitation issues, hygiene, institutional support, and adaptation mechanisms of locals were semi-structured and open-ended discussions on the interview guide. The focus group discussions also assisted in exploring shared experiences in the community, indigenous coping and shared resilience mechanisms. The data were collected using local languages in order to ensure that the participants are at ease and can express their experiences and that they have a contextual understanding of the social and environmental realities.

Thematic analysis was used to analyze the collected data to establish recurrent patterns, meanings, and themes in the narratives and experiences of participants as guided by the researchers (Hussain et al., 2026; Rizwan et al., 2026; Sohail et al., 2021). Interviews and discussions were transcribed and translated where necessary and coded in a systematic way to create major themes with regard to WASH inequalities, institutional problems, climate vulnerability, indigenous adaptation and community resilience. The discussion has accentuated both personal and communal experiences to reflect the sociological aspects of climate-induced WASH insecurity. Triangulation was used to provide the credibility and reliability of the results; this was done by comparing data collected through the interviews, focus groups and the story of the community. The study was done with ethical concerns in mind. The participants were informed about the study objectives, voluntary participation, confidentiality and right to withdraw at any time (Lak et al., 2025; Mutereko et al., 2021; Sohail et al., 2020). All participants gave informed consent and anonymity and care were taken to protect the sensitivities of the community in data collection and reporting.

## 4.0 Findings and Results

The result indicated that climate change has had significant effects on increasing water shortage and expanding disparities in access to water, sanitation, and hygiene (WASH) facilities in rural settlements.

### Theme 1: Climate-Induced Water Scarcity and Unequal Access to WASH Resources

The result indicated that climate change has had significant effects on increasing water shortage and expanding disparities in access to water, sanitation, and hygiene (WASH) facilities in rural settlements. The participants often talked about how long droughts, late rains, increased temperatures and decreased groundwater levels destroyed the traditional water supply networks and caused extreme difficulties to households that were already under the economic vulnerability. It was reported that in most villages, hand pumps, tube wells, ponds and community water sources dried up during summer months meaning that people had to travel long distances in order to get water to drink, cook, wash and feed their livestock. The most burdened group was found to be women and girls since they were the ones charged with the responsibility of water collection and keeping the household clean. Some of the interviewees said that time was wasted by seeking water and this diminished chances of education, income and productivity in the household. The poor households had a more difficult time since they did not have money to install personal boreholes, buy water storage tanks or even to buy water at the hands of commercial buyers. Participants also raised issues related to the quality of water, as they said that the water available was usually muddy, salty or contaminated during times of climate stress. The results show that climate vulnerability is disproportionally experienced by the marginalized populations and enhances the pre-existing social inequalities in terms of access to basic WASH services.

Participant Responses:

- *''10 years ago, it was easy to obtain water at the near wells, but today most of the wells run dry before the summer is over''.*
- *''Women get up very early in the morning since, when we are late, there is no water left in the common source.*
- *''At times we carry containers of two or three kilometers just to get a little bit of water.*
- *''The poor families do not have the money to buy water tankers and then we use the water we can find''*
- *''Children, particularly girls, skip school as they assist their mothers take water home''.*
- *''When it is dry, the water turns yellow and dirty, and we drink it, because we have nothing to drink''.*
- *''People with money install their own pumps and poor people have to wait hours in line with other water points''.*
- *''The climate has caused our everyday existence to be even more difficult''*

**Theme 2: Sanitation Insecurity and Public Health Risks During Climate Events**

The researchers discovered that environmental transformations occurring as a result of climate have greatly deteriorated the sanitation and health risks among the rural populations. Those who resided in flood prone regions said that the excessive rainfall and seasonal flooding was likely to destroy household latrines, sewage system and pollute water sources used to drink. In floods, there was stagnant water around houses and roads making the environment unhygienic, exposing people to diseases. The low supply of water in the drought stricken communities lowered the capacity of households to continue with personal hygiene practices like handwashing, bathing and

cleaning of sanitation facilities. Respondents were accustomed to poorly maintained sanitation conditions and attributed the increasing rates of diarrhea, skin infections, stomach diseases, and fever to poor sanitation among children and the older members of the family. Women raised other issues that were related to privacy, safety and dignity since they lacked proper sanitation facilities in times of environmental emergencies. A number of the respondents added that rural health services were poor and not readily available during climatic disasters making health even more vulnerable. The results indicate that sanitation insecurity has turned into a significant social and health issue that has a close relationship with climate stress and poor rural infrastructure.

Participant Responses:

- *''Floods cause dirty water to enter our houses and toilets not to work properly''.*
- *''After each flood, children fall ill due to contamination of water sources''.*
- *''When we are in drought, we can only save water to drink and therefore it becomes hard to clean up and maintain hygiene''.*
- *''Women are the worst affected since there are no adequate sanitation facilities in case of emergencies''.*
- *''Bad smells and mosquitoes are worse after the rains and most people become sick''.*
- *''We lack adequate drainage channels and as such, wastewater is close to our homes''.*
- *''Health centers are distant and when there is a flood it is not possible to access them''.*
- *''Sanitation conditions are poor, so there is fear of disease each rainy season"*

**Theme 3: Weak Institutional Support, Governance Failures, and Social Exclusion**

The other significant theme that arose because of the results was the perceived ineffectiveness of institutional response and governance systems in terms of climate adaptation and provision of WASH services. Respondents in various communities complained that local government, government departments and development agencies were not satisfactory and that support mechanisms were usually temporary, politically favored, and ill-coordinated. Most respondents affirmed that government aid was primarily only visible in case of serious disasters to provide temporary relief, but there was no long-term planning of water infrastructure, sanitation enhancement, and climate adaptation. Villagers in remote locations especially highlighted emotions of abandonment and marginalization, saying that remote villages were being offered less development activities and emergency aid than politically favored regions. Other barriers to equitable access to WASH facilities and climate-related aid were also identified by several respondents, such as corruption, favoritism, and imbalanced resource distribution. Poor communication between institutions and communities undermined the trust of the people and the community involvement in the adaptation plans. The results suggest that institutional weaknesses and inequalities in governance are major factors that reinforce the tenacity of climate-related WASH in rural settlements.

- Participant Responses:
    - *Officials- Only authorized people visit our village in case of big tragedies and leave afterward.*
    - *We make promises each year, but there is no long-term water problem solution.*

- *Remote villages are left out as politicians only concentrate on those places close to cities.*
- *There is inequality in the distribution of aids since the powerful individuals get more advantages.*
- *Planning of future droughts and floods is lacking.*
- *Government projects are initiated and seldom finished in the right way.*
- *Individuals have lost faith due to lack of listening to the concerns of the communities by those in power.*
- *Poor communities are isolated to handle climate issues by themselves."*

**Theme 4: Community Resilience, Collective Action, and Indigenous Adaptation Practices**

Rural communities exhibited notable resilience and collective adaptation to climate-related WASH insecurity despite the severe environmental and infrastructural challenges experienced. The results indicated that households used to depend on indigenous knowledge, social cooperation, and informal support systems to survive during droughts, floods, and shortage of water. Adaptation techniques reported by participants were various such as harvesting rainwater, temporary water storage, sharing water among neighbors, fixing broken sanitation facilities together and traditional techniques to maintain the water quality. The solidarity of the community became an important coping strategy particularly in times of extreme weather conditions when institutional support was absent or sluggish. Women were significant in planning adaptation activities in households, water management, and community sustenance. Collective resilience in villages was also enhanced by religious values, kin relations and mutual trust. Nevertheless, participants admitted that a lot of local adaptation measures were transient and inadequate in the context of growing severity of climate and population pressures. The participants stressed the necessity of a government support in the long term, climate-responsive infrastructure, and inclusive development policy to empower sustainable community resilience.

**Participant Responses:**

- *When it rains, we gather and preserve the rainwater as we are not sure when we will run out of water.*
- *Neighbors assist one another making use of water in a hard situation.*
- *Members of the community collaborate to clean the streets and put up damaged places during floods.*
- *Women are known to conserve household water, since during drought, a drop of water counts.*
- *Our elders educate us on traditional ways on how to store and preserve water.*
- *Without community partnerships, so many poor families would not live through these circumstances.*
- *People assist one another both emotionally and financially in circumstances of climate crisis.*
- *Local initiatives are only a temporary solution, and there is still a need to implement further government support in the future."*

**Summary of Findings**

The research established that climate change has greatly complicated WASH-related disparities in climate-strained rural settlements by augmenting water scarcity, sanitation insecurity, and exposed populations to health risks. Periodic droughts, rainfall variations, floods, and shrinking ground water supply affected access to safe water and sanitation facilities, especially amongst the marginalized groups of people including low-income households, women, children and geographically isolated populations. This disproportionately affected women and girls as they were most likely to be burdened with water collection and the overall hygiene management of the home, which often impacted education, health, and daily livelihood activities. The poor households were more disadvantaged because of lack of financial resources, poor infrastructure and reliance on unsafe or unreliable water supplies.

The results also indicated that the hygienic conditions declined considerably in conditions of climate-related disasters. The flooding destroyed latrines, drinking water, and spread waterborne diseases, and drought conditions decreased hygiene behaviors due to the scarcity of water. Low access to healthcare, low drainage and poor sanitation facilities also contributed to the increased health hazards to rural populations. The participants always dissatisfied with institutional responses, citing poor governance, unequal distribution of resources, political favoritism, and lack of long-term climate responsive planning. The most common reaction among the respondents was that the government interventions were short lived, inadequate and un-coordinated; particularly in the remote settlements and socially marginalized settlements.

Irrespective of these obstacles, the research established a robust community resilience and local adaptation practices. Indigenous knowledge, social cooperation, informal water sharing systems, rainwater harvesting and community-wide efforts were used by rural households to cope with environmental stress and WASH insecurity. The bonds of community solidarity, kinship and support were very important in assisting the weaker families to deal with the disasters caused by climatic conditions. Nevertheless, participants realized that such adaptation measures were still minimal and short-term without long-term policy sponsorship, better infrastructure, and democratic governance. In general, the results indicate that climate vulnerability and WASH inequalities are intertwined social problems that need community-based, fair, and climate sensitive development strategies.

**5.0 Discussion and Conclusion**

The results of this paper show that climate change has proved to be a significant contributor to WASH inequalities in rural settlements by exacerbating the underlying social, economic, and infrastructural weaknesses. This research found that environmental stressors like droughts, erratic rainfall, floods and diminishing groundwater level had a great impact on access of safe water and sanitation services especially among the marginalized groups (Ali et al., 2025). These results underpin sociological approaches that climate vulnerability does not affect all parts of the society alike; instead, it skews towards socially disadvantaged populations with low economic capabilities, underrepresented by institutions, and lacking adequate infrastructures. The disproportionate impact on women, low-income households and geographically isolated communities is indicative of the larger trends of environmental inequalities in which vulnerable groups are more exposed to

environmental hazards and have less adaptive capacity (Khine & Langkulsen, 2023). The paper also points out that climate-related WASH insecurity is not only an environmental challenge, but a social justice problem, which is influenced by poverty, marginalization, and resource inequality (Tandon et al., 2024).

The results also indicated that insecurity of sanitation and lack of hygiene conditions were on the rise during disasters in climate conditions which posed severe challenges to the public health in rural society. The flooding destroyed sanitation facilities and drinking water sources were contaminated and, due to drought conditions, water sources were scarce to sustain hygiene and sanitation. Such circumstances added to the proliferation of waterborne diseases and health vulnerability, particularly, among children and the elderly people (Ullah et al.). The paper highlights that substandard rural infrastructure and poor health care systems contributed even more to the effects of climate stress on societal health and well-being. Such results can be compared with the previous studies that sanitation disparities are enhanced by the climate change and the resilience of the population against the negative impact of the situation in the rural areas is weakened. The stories of the participants indicate how environmental stress is not only affecting physical access to the WASH resources but social dignity, safety and quality of life, especially of women who have an added issue of privacy and security during the times of sanitation emergencies (Abuzerr et al., 2025).

The next significant contribution of the study is that it examines institutional flaws and governance disparities in the development of rural WASH vulnerability. The participants mentioned the dissatisfaction with the government actions dozens of times, noting temporary actions, unequal redistribution of resources, and the lack of long-term planning of climate adaptation. These results indicate that the inadequacy of governance and institutional coordination diminishes the effectiveness of climate resilience actions in rural communities. The sense of political favoritism and lack of concern towards remote settlements is another sign that social and geographic inequalities affect access to climate-related support and development resources. Sociologically, such governance failures contribute to structural inequalities and undermine trust in formal institutions by communities. The results, hence, highlight the need to have inclusive governance systems, which focus on the equitable provision of services, participatory planning, and long-term investment in climate resilient rural infrastructure.

Although there were devastating environmental and institutional pressures, the researchers observed there were solid signs of community resilience and local adaptation behaviors. Indigenous knowledge, informal sources, collective action, and social solidarity were the main ways by which rural communities managed to face the challenge of WASH insecurity caused by climate change. Activities like rainwater harvesting, water sharing, and shared sanitation proved the relevance of social capital in empowering the local adaptation capacity. The women were the key agents of household-level adaptation and community support networks, which demonstrated their importance in the processes of resilience-building. Participants, however, recognized that local coping strategies were not enough to deal with rising intensity of climate-related challenges. This conclusion indicates that although community resilience is still a valuable resource,

sustainable adjustment needs to be more institutionally supported, climate-sensitive, and long-term based on the development of infrastructure. The paper thus supports the idea of concerted measures, which integrate community-based knowledge with formal systems of governance to realize equitable and sustainable WASH adaptation in climate-prone rural settlements. .

**Contribution**

**Furqan Yaseen:** Problem Identification and Theoretical Framework
**Taimoor Iftikhar:** Data Analysis, Supervision and Drafting
**Saadat Ali:** Methodology and Revision

Conflict of Interests/Disclosures

The authors declared no potential conflicts of interest in this article's research, authorship,and publication.

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