CLIMATE ADAPTATION: AN ANTHOLOGY

Impact, Strategies & Recommendations for a Sustainable Future

POLICY RESEARCH CHALLENGE

FOREWORD

The importance of climate change research has never been more critical, and the contributions of young researchers to this field cannot be overstated. As we face the multifaceted challenges of a warming planet, it is the fresh perspectives, innovative solutions, and relentless curiosity of the next generation that will drive meaningful progress. This anthological report is a testament to the dedication and intellectual rigor of young researchers who are stepping up to address one of the most pressing issues of our time.

In this collection, you will find research papers that span crucial themes such as water, infrastructure, education, health, and employment. Each paper represents a unique contribution to our understanding of how climate change impacts these essential areas of human life and offers insights into potential strategies for mitigation and adaptation. The papers exploring water focus on the impacts of climate change on water resources, including the availability, quality, and management of freshwater. Young researchers delve into issues such as drought, flooding, and the implications for agriculture and urban planning.

The resilience of our built environment is tested as climate change intensifies, and the section on infrastructure highlights innovative approaches to designing and retrofitting infrastructure to withstand extreme weather events and rising sea levels. The research emphasizes sustainable development and the integration of green technologies. Education, a cornerstone of climate action, empowers communities with the knowledge and skills needed to respond to environmental challenges. The included papers discuss the role of education in fostering environmental stewardship and propose curricula and pedagogical strategies to raise climate awareness from an early age.

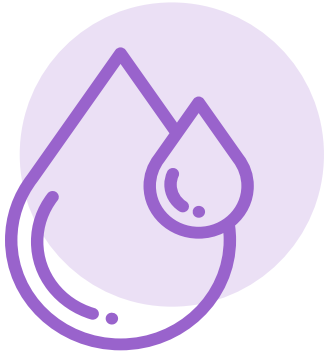
Health impacts of climate change are profound and far-reaching. Young researchers examine how shifting climates influence the spread of diseases, exacerbate mental health issues, and strain healthcare systems. Their work underscores the need for adaptive public health strategies and policies that prioritize vulnerable populations. The transition to a sustainable economy presents both opportunities and challenges for the workforce. The research exploring employment patterns highlights how climate change affects job markets and the potential for green jobs, emphasizing pathways to ensure a just transition that benefits workers and communities alike.

The collective effort represented in this report is a beacon of hope and a call to action. The passion, creativity, and scientific rigor of these young researchers inspire confidence in our ability to confront and address the complexities of climate change. It is through their work that we see the potential for a sustainable and equitable future.

As you read through these papers, may you be inspired by the ingenuity and dedication of the next generation of climate scientists. Let their research inform your understanding, spark new ideas, and motivate further action towards a resilient and sustainable world.

POLICY STATEMENTS

THEME: WATER



PAPER 1: INVESTIGATING THE IMPACT OF FLOOD-INDUCED CLIMATE CHANGE ON FRESHWATER RESOURCES IN HUB, BALUCHISTAN

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OVERVIEW

More than 72% of rural residents in Baluchistan rely on streams and wells that have been extensively excavated. The research paper highlights the detrimental impact of climate change on groundwater, emphasizing the necessity of filtration for drinkable water. The increasing Total Dissolved Solids (T.D.S) levels in water due to climate change have led to a rise in migration from affected areas. Despite numerous studies on the climate›s effect on freshwater, insufficient steps have been taken to mitigate climate change.

The paper focuses on the impact of climate change on freshwater resources in Balochistan. It highlights the severe consequences of climate change on water availability and quality, addressing how these changes affect the socio-economic conditions of the local population. The research underscores the urgency of implementing effective water management and conservation strategies to mitigate these impacts and ensure sustainable water resources for the future.

Despite extensive literature on the subject of climate change impact, significant research gaps remain, particularly in understanding and mitigating the effects of climate change on freshwater resources in Balochistan. Observations of significant landscape changes following heavy rainfall events, prompting migration due to freshwater scarcity, highlight the urgent need for further research and action. Implementing sustainable water management practices and technologies is critical to addressing these challenges and ensuring the long-term availability of freshwater resources in the region.

METHODOLOGY

The study employs a qualitative research design, utilizing various data collection instruments to gather comprehensive information from participants. The sample size comprises 75 individuals, including 25 flood-affected individuals and 50 laborers from Balochistan. A simple random sampling technique was used to select the sample, and the data was analyzed using descriptive statistical techniques, specifically employing percentage methods. The research also involved a visit to an industrial site to understand the water filtration processes necessary to make climate-affected water potable.

RESULTS AND DISCUSSIONS

Balochistan faces unique challenges due to its distinct climates and water availability patterns. The northern and southern regions of Balochistan exhibit significant geographical variations in pollution and water quality. Effective water conservation strategies, such as a

basin-wise water monitoring system and the cultivation of low-water crops, are essential. Community participation and stakeholder involvement are crucial to resolving the water crisis and mitigating the impacts of climate change on freshwater resources.

The findings indicate that climate change significantly impacts the freshwater resources in Balochistan. The escalating droughts caused by heat waves leave communities with no choice but to migrate, leading to homelessness and numerous challenges. By addressing climate change›s impact on freshwater, we can ensure drinkable water without filtration, prevent mass migration, control climate-related disasters, stabilize T.D.S levels, reduce drought risk, and provide access to safe drinking water for impoverished communities reliant on streams.

Key results of the report indicate that:

1. **Perception of Water Potability:** 96.2% of respondents believe that water cannot be drunk without filtration, indicating a widespread concern about water quality.
2. **Impact on Groundwater:** A substantial portion (73.1%) agrees that climate change is harmful to groundwater.
3. **Increasing Effects of Climate Change:** Most respondents (82.7%) acknowledge that the impact of climate change on freshwater resources is increasing.
4. **Effect on Total Dissolved Solids (TDS):** Almost all participants i.e. (96.2%) agree that climate change affects the Total Dissolved Solids (TDS) levels in water.

These results indicate that climate change exacerbates water scarcity, impacting agricultural productivity, community water supplies, and groundwater resources. Rising temperatures increase evaporation rates and alter precipitation patterns, leading to more frequent and intense droughts and floods. This has a direct impact on the socio-economic conditions in Balochistan, with water scarcity leading to conflicts over resources and migration in search of better water availability.

Ms Zahra highlights that climate change leads to reduced agricultural productivity, challenges in meeting water demands, increased water scarcity due to higher evaporation rates, and more frequent extreme weather events. These changes disrupt ecosystems and increase socio-economic vulnerabilities, emphasizing the need for urgent adaptation measures to build resilience against climate change impacts.

POLICY RECOMMENDATIONS

The document recommends several strategies to address the challenges posed by climate change on freshwater resources in Balochistan:

1. **Community Adaptation Strategies:** Leveraging indigenous knowledge and community-based adaptation strategies to cope with changing water availability. This includes focusing on traditional water management practices and enhancing community resilience efforts. Implementing community-driven initiatives to build resilience against climate impacts

2. **Integrated Water Resource Management (IWRM):** Develop and promote IWRM approaches that encompass water harvesting, storage, and efficient distribution systems to mitigate the risks of water scarcity and ensure sustainable water supply.

3. **Water Conservation Efforts:** Promoting water conservation initiatives and sustainable water management practices to ensure the long-term availability of freshwater resources. Invest in sustainable water management practices, including rainwater harvesting and modern filtration systems, to ensure the long-term availability of freshwater resources.

4. **Policy and Regulatory Frameworks:** Establish and enforce robust policy and regulatory frameworks that support sustainable water management and climate adaptation efforts.

By adopting these recommendations, policymakers and stakeholders can develop effective adaptation strategies, ensuring sustainable development and resilience in Baluchistan's freshwater ecosystems and supporting the well-being of its communities.

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PAPER 2: CLIMATE CHANGE AND WATER SCARCITY IN BALUCHISTAN: POLICIES AND GAPS

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OVERVIEW

This research investigates the water scarcity crisis in Quetta, Baluchistan, Pakistan, which has been exacerbated by climate change. The study focuses on the availability and quality of water, examining the effectiveness of current policy frameworks. Utilizing a mixed-method approach, water samples were analyzed for Total Dissolved Solids (TDS), and public perceptions were gauged through questionnaires. The findings indicate significant issues with water quality and management, highlighting the urgent need for resilient policy interventions and improved infrastructure to address the growing water scarcity problem.

Previous studies have extensively documented the impact of water scarcity in Quetta. Barrech et al. (2018) highlighted the adverse effects of water scarcity on the economy, agriculture, and public health, calling for government intervention and public awareness initiatives. Kakar et al. (2018) focused on the socioeconomic impacts of water scarcity, identifying factors such as overuse of electric tube wells and inadequate drought control measures as contributors to the problem. These studies emphasize the necessity of sustainable water management practices and community involvement to mitigate the water crisis.

METHODOLOGY

The study employed a mixed-method approach, incorporating both qualitative and quantitative data. A total of 30 questionnaires were distributed among the public to gather insights on water scarcity. Additionally, water samples were collected from various areas in Quetta to analyze their suitability for consumption.

Data collection was carried out by three teams, each comprising two members. They collected water samples and filled out questionnaires from different areas of Quetta, ensuring a balanced representation of male and female respondents. The primary data was gathered from regions such as Killi Khaizi, Killi Barat, and Brewery, while secondary data was collected from the same areas.

Water samples were collected in bottles labeled with the respective areas and analyzed using a Total Dissolved Solids (TDS) meter to determine their suitability for drinking.The TDS levels of the water samples were also analyzed and plotted to assess water quality across different areas.

RESULTS AND DISCUSSIONS

The results reveal critical insights into the water scarcity issues in Quetta:

1. **Water Quality:** The TDS levels in water samples varied significantly, with the highest being 724 ppm in Killi Khaizi and the lowest being below 300 ppm in only two areas, indicating poor water quality in most parts of Quetta.

2. **Public Perception:** A significant majority (85.71%) of respondents expressed dissatisfaction with current water management strategies. Frequent water shortages were reported by 47.62% of residents on a weekly basis.

3. **Causes of Water Scarcity:** The primary factors identified were poor infrastructure (37.04%) and mismanagement of water resources (33.33%), followed by climate change (18.52%) and population growth (11.11%).

4. **Government Intervention:** Most respondents (76.19%) believed that government intervention in addressing water scarcity was insufficient.

5. **Effectiveness of Water Conservation Efforts:** The majority (61.90%) felt that current water conservation efforts were ineffective.

6. **Lack of will to act:** 66.67% of people believed that the government is not serious about the problem and has no intention in the conservation of this resource

POLICY RECOMMENDATIONS

Based on the findings, the following policy recommendations are proposed to address the water scarcity issue in Quetta:

1. **Infrastructure Upgrades:** Invest in modernizing the water infrastructure to reduce losses and improve water distribution efficiency.

2. **Effective Water Resource Management:** Implement robust water management policies that include regular monitoring of water quality and quantity.

3. **Community Engagement and Awareness:** Launch community engagement programs and awareness campaigns to educate the public on water conservation practices.

4. **Sustainable Practices:** Promote sustainable water usage practices and encourage the adoption of water-saving technologies.Government Commitment: Ensure strong governmental commitment to addressing water scarcity by allocating sufficient resources and enforcing relevant policies.

5. **Technological Resources:** Enhance the technological capabilities for water management, including the use of advanced monitoring and data analysis tools.

6. **Collaborative Efforts:** Foster collaboration among government agencies, non-governmental organizations, and the local community to develop and implement effective water conservation strategies.

By addressing these recommendations, Quetta can work towards mitigating the severe water scarcity issues and ensuring a sustainable water future for its residents.

PAPER 3: ANALYSES OF THE IMPACT OF WATER QUALITY STANDARDS AND SUSTAINABLE URBAN WATER MANAGEMENT ON HEALTH OF LOCALS IN KARACHI

CONTRIBUTER

Ehsan Ullah Irshad

OVERVIEW

This research focuses on the connection between water quality, management practices, and public health in Karachi, while investigating the water quality of seven Karachi districts (Nazimabad, Gulshan, Karachi South, Orangi, Korangi, Malir, and Keamari) and its impact on public health. . The study reveals significant concerns regarding pH levels that exceed safe drinking water standards set by the WHO. Both alkaline and acidic deviations were observed across the districts, highlighting a widespread issue.

Health data collected from local hospitals showed a notable correlation between poor water quality and public health problems. Reported ailments such as diarrhea, nausea, and skin rashes suggest potential waterborne illnesses affecting the population. Despite efforts by some individuals to boil water before consumption, a substantial portion of the surveyed population still relies on untreated tap water or bottled water, indicating gaps in awareness and access to safe drinking water sources.

Water source contamination poses substantial risks to public health, fostering the spread of waterborne diseases and diminishing quality of life. Evaluating water quality standards and enhancing sustainable urban water management policies are paramount. Recent studies in Pakistan underscore the urgency of assessing current policies and identifying opportunities for enhancement to guarantee safe, clean water for urban populations.

METHODOLOGY

Data collection methods for the paper included:

- **Survey:** A structured survey collected demographic data, self-reported health information, water consumption practices, and awareness of water quality issues from residents across Karachi's seven districts.
- **Water Sampling:** Water samples were collected from one randomly selected household in each of Karachi's seven districts. These samples underwent analysis for various chemical parameters relevant to assessing water quality.

A total sample size of 70 participants was selected, with 10 households sampled from each of Karachi's seven districts. Initially considering convenience sampling for ease of access, the study recognized potential bias and instead employed a stratified random sampling approach. This ensured representation from each district within the population.

Descriptive statistics were generated to summarize demographic information, self-reported health data, and water consumption practices among the participants.

RESULTS AND DISCUSSIONS

The study revealed that of the 7 districts surveyed not even one districts had water matching the standards of water quality fit for human consumption with some districts having lethal levels of pH.

S no	District	pH Level	Normal pH Range	Status
1	Nazimabad District	10.2	8.5 - 6.5	Undrinkable
2	Gulshan District	5.8	8.5 - 6.5	Undrinkable
3	Karachi South District	9.5	8.5 - 6.5	Undrinkable
4	Orangi District	4.1	8.5 - 6.5	Undrinkable
5	Korangi District	4.1	8.5 - 6.5	Undrinkable
6	Malir District	9.1	8.5 - 6.5	Undrinkable
7	Keamari District	3.9	8.5 - 6.5	Undrinkable

The analysis of water samples from seven districts (Nazimabad, Gulshan, Karachi South, Orangi, Korangi, Malir, and Keamari) revealed concerning pH levels outside the safe drinking water range as per WHO guidelines (World Health Organization, 2023).

- Self-reported health problems include diarrhea, nausea, abdominal pain, skin rashes, fever, respiratory problems, and eye infections.
- Males appear more susceptible to these illnesses, suggesting gender differences in susceptibility.
- Water consumption practices show a majority boil water, but some rely on untreated tap water or bottled water.
- There is a very low level of awareness about water quality issues among the surveyed population.
- Poor water quality correlates strongly with high rates of health problems in Karachi.

Study reveals significant self-reported health issues across hospitals in the surveyed districts, with diarrhea being the most prevalent, followed by nausea, abdominal pain, skin rashes, fever, respiratory problems, and eye infections. These symptoms are indicative of waterborne illnesses typically caused by ingesting contaminated water (Centers for Disease Control and Prevention, 2023).

There was a higher susceptibility among males to suffer from water borne diseases, underscoring potential gender-related factors influencing health outcomes that warrant further investigation. Though many of those surveyed reportedly boiled water before consumption, a notable portion still resorts to untreated tap water or bottled water, raising concerns about exposure to contaminants.

The study found a pervasive lack of awareness among the surveyed population about water quality issues, indicating a critical need for educational initiatives. The data collected underscores a clear link between poor water quality and public health issues in Karachi, where contaminants and altered pH levels in water sources contribute significantly to waterborne diseases (World Health Organization, 2018).

POLICY RECOMMENDATIONS

Addressing Karachi's water quality crisis necessitates a comprehensive approach involving infrastructure improvements, stricter regulations, community education, and public health interventions. For the purpose the following is suggested

1. **Infrastructure Upgrade:** It is crucial to invest in upgrading Karachi's water supply network by replacing aging and leaky pipes. This measure will prevent contamination and ensure the reliable delivery of clean water to residents.

2. **Industrial Waste Management:** Implementing stricter regulations and enforcing proper treatment of industrial waste before discharge are essential steps to reduce pollutants in water sources from industrial activities.

3. **Sustainable Water Management Practices:** Promoting initiatives such as rainwater harvesting and exploring alternative sources like desalination can alleviate pressure on groundwater resources and mitigate saltwater intrusion. Encouraging water conservation efforts will further optimize water distribution and usage efficiency.

4. **Improved Wastewater Treatment:** Investing in and upgrading wastewater treatment plants is critical to effectively treat sewage and prevent its contamination of water sources.

5. **Public Awareness Campaigns:** Utilizing media platforms and community outreach programs to educate residents about the significance of safe drinking water, the risks associated with contaminated water, and proper water treatment methods such as boiling or using filters.

6. **Community Engagement:** Collaborating with community leaders and organizations to raise awareness and encourage residents to adopt safe water practices. Initiatives could include distributing water filters or offering subsidized rates for boiling pots.

7. **School Education Programs:** Integrating water quality education into school curriculums to raise awareness among younger generations and promote responsible water usage habits from an early age.

The alarming data from the study underscores a severe public health issue in Karachi. The presence of unsafe drinking water, as indicated by varying pH levels across districts and high rates of reported health problems, demands urgent intervention.

Addressing Karachi's water quality crisis requires a comprehensive approach. This includes upgrading infrastructure, implementing stricter regulations for industrial waste management, and adopting sustainable water practices to ensure reliable access to clean water. Public awareness campaigns are essential to promote safe water consumption behaviors.

Effective collaboration among government agencies, utility providers, public health officials, and the community is crucial to address this crisis effectively.

By prioritizing improvements in water quality and empowering residents through education, we can collectively strive for a healthier Karachi. Further research focusing on district-specific variations and exploring cost-effective water treatment solutions will strengthen our efforts. The time to act decisively is now.

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PAPER 4: PROTECTING WATER RESOURCES: EXAMINING THE IMPACT OF WASTE DISPOSAL ON THE SWAT RIVER.

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OVERVIEW

This study explores water contamination sources and their broader impacts on ecosystems using the River Swat as a case study. The study assessed the impact of improper waste disposal on the water quality of the Swat River and identified primary pollutants responsible for posing risks to public health and evaluated the existing waste management practices in the Swat Valley

Findings indicate that plastic waste, pharmaceuticals, and industrial effluents are significant contributors to water contamination in the River Swat. Analysis reveals that over 55.32% of the water is deemed unsafe for drinking or household use due to contamination. This degradation of water quality poses serious threats to both ecosystems and human health.

Previous studies have already established that the Current contamination jeopardizes the well-being and livelihoods of millions who depend on the Swat River for agriculture and potable water(Singh, Khan, & Ahmed, 2022).

The population in the research area regularly interacts with water from the Batkhela Canal, primarily used for irrigation, through drinking and bathing. Local residents dispose of solid waste, while industrial and commercial effluents are directly discharged into the canal. These activities pose a potential threat that demands immediate attention. The water quality in the study area is compromised by irresponsible discharge of industrial and residential effluents. Currently, there is a lack of comprehensive scientific research on surface water quality, contaminant sources, and associated human health risks.

The study focuses on assessing how human activities impact surface water quality, utilizing the sodium adsorption ratio and water quality index models for evaluation. It also aims to analyze the health risks posed by ingestion and skin contact with contaminated water for both adults and children.

METHODOLOGY

In order to investigate the effect of water disposal on the pollution of the Swat River Principal component analysis and correlation analysis statistical techniques were used this helped in identifying various causes of pollution, both man-made and natural.

The complex social, environmental, and policy processes surrounding water contamination were examined in depth using qualitative methodologies

Approximately 18 participants were selected for semi-structured interviews, including individuals such as doctors, professors, representatives from local NGOs, and members of the media. In the FGDs, participants from various sectors such as WSSC, EPA, TMA, and community leaders actively contributed their insights and perspectives. The total sample size for the study was 36 participants, with saturation guiding the determination of sample size to ensure comprehensive data collection

Participant observations, focus group discussions (FGDs), and semi-structured interviews constitute the primary data collection methods employed in this study. Semi-structured interviews enable in-depth exploration of individuals' perspectives and experiences regarding governance policies and water quality.

FGDs foster group dynamics, uncovering common themes and collective insights among community members. Participant observations provide contextual insights into daily water-related activities and their role in water contamination. These methods were chosen for their ability to generate qualitative data that captures the complexities of water governance issues in the Swat Valley effectively.

RESULTS AND DISCUSSIONS

Thirty water samples were gathered and examined by researchers in order to evaluate a number of factors, including heavy metals. With the exception of copper, nickel, and lead, which were found to be higher than acceptable levels in a notable proportion of samples, the majority of the physicochemical characteristics and heavy metal concentrations were within the limits set by the World Health Organization for drinking water.

The Swat River's water quality faces significant degradation from multiple pollution sources, highlighted through thematic analysis of focus group discussions (FGDs). Plastics, medical waste, industrial effluents, and local business waste all contribute to this deterioration, posing serious environmental and health risks. Plastics not only mar the river's beauty but also endanger aquatic life through ingestion-related harm. Medical waste, including hazardous materials, threatens human health and contaminates river water, necessitating proper waste management. Industrial activities, particularly from marble factories, further degrade water quality with chemical-laden effluents, impacting downstream communities. Addressing these challenges requires coordinated action, including stricter regulations, enhanced waste management practices, and community engagement to safeguard the river ecosystem.

Because of its high sodium and salinity content, the water quality index ranged from bad to extremely poor, meaning it was unfit for domestic use and drinking. The population utilizing this water has a noncarcinogenic health risk linked with heavy metal exposure, according to assessments of the hazard index and hazard quotient (Jehan et al., 2019).

Thematic examination of the Swat River's impact on daily life reveals health consequences resulting from water quality concerns as a major theme. There is general concern among

participants about the water's quality and possible impacts on public health. While some people say they have no personal health concerns, others mention using river water as a source of skin irritations, stomach problems, and waterborne infections.

The Swat River's water quality is significantly compromised by various pollution sources, as revealed in thematic analyses of focus group discussions (FGDs). Plastics, medical waste, industrial effluents, and local business waste all contribute to this degradation, posing substantial risks to the environment and human health. Plastics, ubiquitous in modern society, not only detract from the river's natural beauty but also endanger aquatic life through ingestion-related harm.

Medical waste, such as syringes and hazardous materials, threatens public health and contaminates the river, underscoring the need for improved waste management practices. Industrial activities, particularly from marble factories, further escalate pollution levels with chemical-laden effluents, impacting downstream communities reliant on the river. Addressing these challenges requires concerted efforts, including stricter regulations, enhanced waste management practices, and community engagement initiatives to mitigate pollution and safeguard the river ecosystem.

POLICY RECOMMENDATIONS

1. Septic tanks for effluent treatment within the valley
2. Utilizing hospital waste in cement manufacturing
3. Climate change Policies should ensure evidence-based and should ensure inclusivity and better representation of the local community to protect public health and ecological balance in the Swat River basin.

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THEME: EDUCATION

PAPER 1: IMPACTS OF CLIMATE CHANGE-INDUCED FLOODS ON SECONDARY GIRLS› EDUCATION IN HUB, BALOCHISTAN

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OVERVIEW

The research explores the significant impacts of climate change-induced floods on girl's secondary education in Balochistan Hub. The study explores the impacts of climate change-induced floods on secondary girls' education and identifies the factors that contribute to these impacts and to propose strategies for adopting the impacts of floods on girls' education. the policy research emphasizes the urgency of bridging the gap between climate resilience and girls' education. By prioritizing evidence-based interventions, gender equity, and community engagement, we can ensure quality education for all, even amidst environmental challenges.

The study delves deep into the socio-economic factors contributing to the vulnerability of girls' education during floods in Balochistan Hub, while exploring the perceptions and attitudes of stakeholders towards girls' education and climate resilience. The study area includes flood-prone areas such as Sakran, an industrial city with significant flood-related challenges, including economic strain and impacts on mental and physical health.

Studies highlight the profound effects of floods on infrastructure, loss of learning time, and disruptions to communities, particularly impacting girls' education. Historical agricultural practices, land use changes, and socioeconomic challenges exacerbate these effects. Research emphasizes the need for mitigation and adaptation strategies such as infrastructure resilience, safe travel routes, gender-sensitive policies, and community resilience to address these challenges and enhance the resilience of girls' education in flood-affected areas. However, further research is needed to fully understand the specific impacts and identify effective mitigation and adaptation strategies.

There is a notable scarcity of empirical studies specifically addressing girls' education during floods in the region, highlighting a need for more research to understand the nuances of this issue. The existing studies lack a nuanced consideration of cultural norms, socioeconomic disparities, and community dynamics, which are crucial factors influencing girls' access to education during and after flood events.

METHODOLOGY

The study used a mixed-method approach, combining qualitative and quantitative research methods. Data collection involved semi-structured interviews, focused group discussions (FGDs), surveys, and questionnaires. A purposive sampling technique was used to select 12-18 secondary school girls from flood-prone areas in Balochistan Hub. The data was analyzed using a mixed-method approach, with qualitative data analyzed thematically and quantitative data analyzed using statistical tools.

RESULTS AND DISCUSSIONS

The floods severely impacted Balochistan Hub, worsening education challenges in a province where 6 out of 10 children have either never enrolled in school or dropped out before completing primary education (World Forum). Despite this adversity, opportunities have emerged in the shape of the newly built Government Girls Primary School in the village of Mohammad Ramzan Jamot, Lasbela district, for flood effected children who now learn in safer and cleaner environments with improved learning materials. the facility is the only source of learning within a 15-kilometer radius, benefiting 45 enrolled students and 120 families in nearby villages.

Enrollment Trends in GGPS Mohammad Ramzan Jamot

Year	Enrolled Girls
2022	30
2023	40
2024	50 (projected)

Thes study found that the issue of disruption to girls' education was multi layered involving social, culture, religious, health and economic factors.

1. **Social Factor:** Families living in flood-prone areas like Sakran are frequently displaced during extreme weather events. Girls often have to relocate to temporary shelters or the homes of distant relatives. This displacement disrupts their daily routines, making consistent school attendance difficult. infrastructure damage exacts further toll to girl's education the lack of safe and conducive learning environments exacerbates the situation resulting in Girls missing out on valuable learning time, affecting their overall educational progress.

2. **Health factor:** The floods not only damage physical infrastructure but also have indirect consequences on girls' well-being. Food scarcity becomes a significant issue as floods damage crops, create food shortages, and disrupt supply chains. Malnourished girls struggle to concentrate in class, affecting their cognitive abilities, as proper nutrition is essential for effective learning. Additionally, the trauma of witnessing floods and experiencing displacement takes a toll on mental health. Girls may face anxiety, fear, and uncertainty, which further hinder their ability to engage in learning. These combined factors highlight the multifaceted impact of floods on girls' education and overall well-being. Existing literature highlights the gendered impact of floods. Girls face unique barriers due to cultural norms, safety concerns, and limited mobility Studies from other regions—such as Bangladesh, India, and parts of Africa—have documented similar challenges

POLICY RECOMMENDATIONS

1. **Gender-Responsive Policies:** Policies must prioritize girls' education by incorporating gender-sensitive measures. This includes providing menstrual hygiene facilities, ensuring safe transportation, and offering flexible school hours to accommodate the unique needs of girls. The Baluchistan education department should provide training to teachers on gender-sensitive teaching methods.

2. **Disaster Preparedness:** Schools should conduct regular drills to prepare students for emergencies. Educators must be trained to handle psychosocial support during crises. Schools should play their pivotal role to raise awareness about the importance of girls' education and challenge gender norms.

3. **Community Engagement:** Parental awareness campaigns at the community level can educate parents about the importance of girls' education, emphasizing the need to send girls back to school promptly after floods for their long-term development. Additionally, local adaptation strategies are vital, such as establishing temporary learning centers during floods or using community halls as makeshift schools to maintain educational continuity.

4. **Improved infrastructure:** Provincial government must invest in flood-resistant school buildings by elevating structures, reinforcing walls, and designing safe evacuation routes to minimize disruptions during floods. Additionally, improving transportation infrastructure is crucial to reduce distance barriers and ensure girls have consistent access to education.

There is a need to explore the long-term impacts of disrupted education on girls' academic and socio-economic outcomes. addressing the challenges faced by girls' education in Balochistan Hub requires a multi-faceted approach that integrates education, gender equality, and climate resilience. By implementing targeted policies and interventions, we can create a more resilient education system that empowers girls and prepares them to face future challenges.

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PAPER 2: INVESTIGATING THE IMPACT OF CLIMATE-INDUCED DISASTERS ON THE EDUCATION SYSTEM IN ZHOB, BALOCHISTAN

CONTRIBUTER

Hafiz M Rameez

OVERVIEW

In rural Pakistan, the intersection of climate change and resulting disasters significantly challenges the education system. Pakistan is particularly vulnerable to climate-induced events such as floods, droughts, and extreme weather, profoundly impacting rural education. The Intergovernmental Panel on Climate Change (IPCC) has noted that South Asia, including Pakistan, will experience more frequent and intense extreme weather events due to global climate change (IPCC, 2018). These climatic disruptions have cascading effects on rural education infrastructure, affecting accessibility, quality, and overall resilience.

The policy research studies the nuanced interplay between climate change, disasters, and its impact on the rural education landscape. Already mired by mismanagement and corruption the education sector is in dire need of redressal from the provincial government.

This study assesses the immediate impacts of climate-induced disasters on rural schools in Pakistan, focusing on changes in accessibility and attendance rates. It also seeks to investigate the long-term effects of these disruptions on educational infrastructure, including damage to school buildings and facilities. Additionally, the study explores community perceptions and adaptive strategies employed in response to climate-related disruptions in the rural education sector.

Previous studies within Pakistan have emphasized the intricate linkages between climate change-induced disasters and educational outcomes in rural settings. Understanding these impacts is crucial to comprehending the nuanced interplay between climate-induced disasters and the rural education system, laying the groundwork for strategic interventions that promote resilience and sustainable development in these vulnerable communities. A study by the Pakistan Meteorological Department (PMD) highlights the escalating vulnerability of rural schools to climate-related disruptions, citing instances of school closures, infrastructure damage, and compromised learning environments due to floods and other climatic extremes (PMD, 2020).

Khan et al. (2019) conducted a comprehensive analysis of flood-induced disruptions in rural education, revealing a significant increase in school closures and a decline in

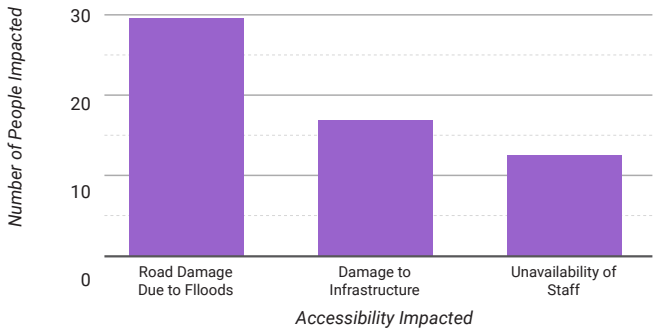
attendance rates in affected regions. Their findings highlight the need for adaptive measures to mitigate the adverse effects of climate-related disasters on educational continuity. Similarly, Ahmed et al. (2021) examined the impact of droughts in rural Pakistan, identifying a strong correlation between water scarcity and reduced educational resources. Their study underscores the vulnerability of schools in arid regions, where water shortages hamper daily operations and degrade the learning environment. This aligns with Qureshi and Ali (2018), who explored the long-term effects of extreme weather events on educational infrastructure, showing that damaged school buildings and inadequate facilities significantly hinder the educational progress of rural students.

METHODOLOGY

The research design employed a sequential explanatory mixed-method approach, starting with quantitative data collection through surveys to assess immediate impacts. This was followed by qualitative data collection via interviews and focus groups to gain deeper insights into community perceptions and adaptive strategies.

Quantitative data was gathered through structured surveys administered to school administrators, teachers, and community members. Qualitative data was obtained through semi-structured interviews and focus group discussions involving key stakeholders such as community leaders, educators, and local government officials. Purposive sampling was used to select 60 rural schools in Zhob District affected by climate-induced disasters, ensuring representation of varying impact severities. Participants for interviews and focus groups were selected using purposive and snowball sampling methods to capture diverse perspectives. Data analysis procedures included descriptive statistics for quantitative data, summarizing changes in accessibility and attendance rates, while qualitative data underwent thematic analysis to identify recurring themes and patterns

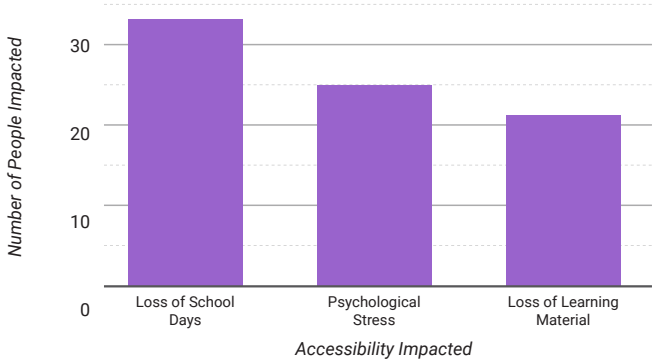
Impact of climate disasters on accessibility in Zhob Schools (N=60)



The study highlights key factors affecting school accessibility in Zhob, Balochistan, with road damage from floods being the primary issue, followed by infrastructure damage and staff unavailability. These findings underscore the crucial role of infrastructure resilience in maintaining ongoing access to education amidst climate disasters (Smith, 2018). Additionally, the shortage of staff emphasizes the significance of effective human resources management in disaster-prone regions (Johnson, 2019).

The instant graph in the study outlined the factors contributing to poor attendance in schools, with loss of school days, psychological distress, and loss of learning materials being the primary contributors. This aligns with the literature highlighting the detrimental impact of climate disasters on students› mental health and well-being (Brown, 2020). Psychological distress can impede students› ability to attend school regularly and engage in learning activities, emphasizing the need for psychosocial support interventions (Miller, 2021).

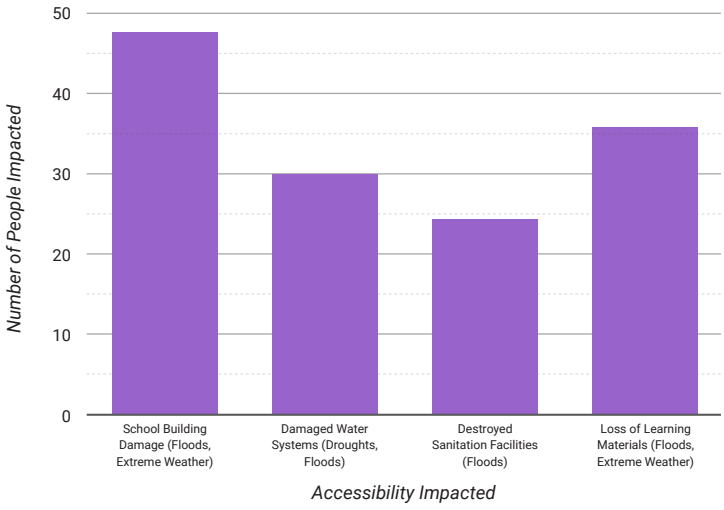
Impact of climate disasters on Attendance in Zhob Schools (N=60)



The study also surveyed the percentage of attendance for males and females following climatic disasters, indicating that the female population is impacted the most. This finding resonates with research demonstrating that women and girls are disproportionately affected by climate-related hazards due to pre-existing social and economic vulnerabilities (Thomas, 2019). Gender-sensitive disaster risk reduction strategies are essential to address these disparities and ensure equitable access to education for all (Robinson, 2020).

Damaged buildings, extreme weather conditions, and inadequate maintenance were identified as contributing factors affecting school attendance. Ensuring adequate infrastructure is crucial for providing a safe and conducive learning environment (Wilson, 2022). Investment in resilient infrastructure and implementation of effective maintenance protocols are essential steps to mitigate the impact of climate disasters on school facilities (Anderson, 2017).

Long term effects of climate disasters on Zhob Schools (N=60)



The graph in the study illustrated the long-term consequences of climate disasters on schools and related facilities, with school building damage being the most significant issue. Additionally, damaged water systems, sanitation facilities, and loss of learning materials further exacerbate the challenges faced by educational institutions. These findings underscore the importance of disaster preparedness and resilience-building measures in education sector planning (Jones et al., 2020).

POLICY RECOMMENDATIONS

1. **Interagency multi sectorial collaboration:** Effective policy measures should emphasize collaboration between government agencies, educational institutions, and local communities to foster sustainable development and ensure continued access to quality education in disaster-prone regions.

2. **Targeted interventions:** addressing gender disparities and psychosocial support are crucial to ensure equitable access to education and enhance the resilience of vulnerable communities

3. **Community mobilization:** implementing community-based adaptation strategies and integrating climate resilience into education sector planning can enhance the overall preparedness and adaptive capacity of schools to withstand future climate-related disruptions

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PAPER 3: EXPLORING CLIMATE CHANGE: IMPACTS ON GIRLS PRIMARY EDUCATION IN LASBELA BALOCHISTAN.

CONTRIBUTER

Aitazaz Ahmed

OVERVIEW

The study looks into the socio-economic vulnerabilities affecting girls' primary education in flood-prone Lasbela, Balochistan, based on the findings the study suggests targeted interventions to focus on resilient infrastructure, financial support to families, and community engagement as measures to counter and protect communities most susceptible and vulnerable to climate change. The suggested measures aim to mitigate climate change-induced disruptions, ensuring sustained access to education and promoting resilience among vulnerable populations.

The study reveals significant disruptions in girls' education following a flood event, with an average 17% dropout rate, a 32% change in performance, and a substantial 51% decline in attendance observed across ten schools. Financial constraints emerged as the primary contributing factor, accounting for 68% of the disturbance in girls' education. These findings highlight the profound impact of climate change-induced disasters on socio-economic vulnerabilities, particularly among families in Lasbela, underscoring the urgent need for targeted interventions to mitigate these effects and promote educational resilience in the face of climate change challenges.

Pakistan, particularly regions like Lasbela in Balochistan, faces significant challenges as one of the nation's highly affected by climate impacts (NDMA, 2022). The devastating floods of 2022 in Lasbela highlighted the harsh realities of climate change, impacting critical elements such as freshwater resources, agriculture, mental health, and education (UNDP, 2023). Education emerges as a prominent concern in this context, particularly for vulnerable groups like girls (UNICEF, 2022). However, climate change-induced floods severely hinder girls' access to education, emphasizing the urgent need to address this issue (UNESCO, 2020).

Addressing the intersection of climate change and education, especially for vulnerable populations like girls, is crucial in Lasbela, a region highly susceptible to climate-induced disasters such as floods. These events disrupt various aspects of life, notably education. Understanding the specific challenges girls face in accessing primary education due to these climate impacts is essential for developing effective policies and interventions. By highlighting the barriers they encounter, this study informs targeted strategies to protect girls' right to education in Lasbela amid escalating climate impacts, thereby contributing to sustainable development efforts in the region.

Estimations from the Malala Fund for 2021 underscore the anticipated hindrance of millions of girls from completing their education due to climate-related events, with projections indicating a substantial increase by 2025 (Malala Fund, 2021). Despite this alarming trend, existing research tends to focus primarily on tertiary education, with minimal attention given to primary and secondary school education, as reflected in the National Education Policy 2017-2025.

METHODOLOGY

A mixed-methods of combining qualitative and quantitative research design were employed for the research.

On-the-ground data collection was conducted through in-person visits to 10 affected girls' schools in Lasbela to assess the flood's impact on infrastructure, learning environments, and the overall educational ecosystem.

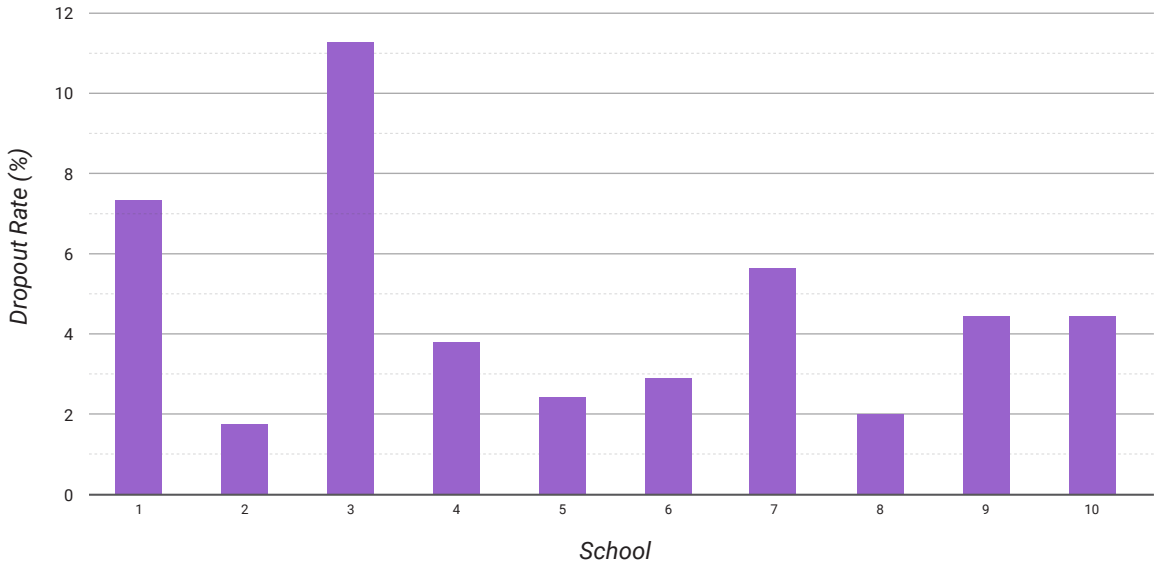
Additionally, in-depth interviews were conducted with girls, teachers, and community leaders during these visits to gather personal narratives and qualitative insights into the specific challenges faced.

A meeting with 15 stakeholders was organized involving community leaders, educators, parents, and local officials to gather qualitative insights and understand broader social, economic, and cultural factors influencing girls' education post-flood.

A structured questionnaire was also designed to collect quantitative data on dropout rates and socio-economic conditions. The questionnaire was administered in selected schools, ensuring a systematic and representative sample. Friends from flood-affected villages were involved in distributing and collecting questionnaires to reach a broader spectrum of participants while maintaining ethical standards and ensuring informed consent.

RESULTS AND DISCUSSIONS

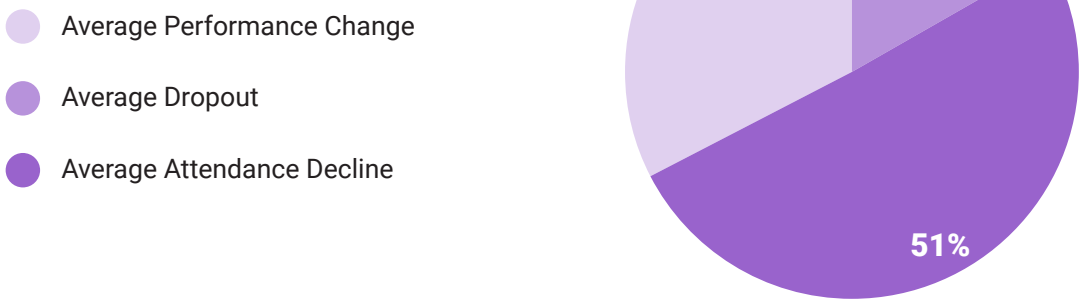
Percentage of dropout girls in ten selected schools in Lasbela after floods of 2022

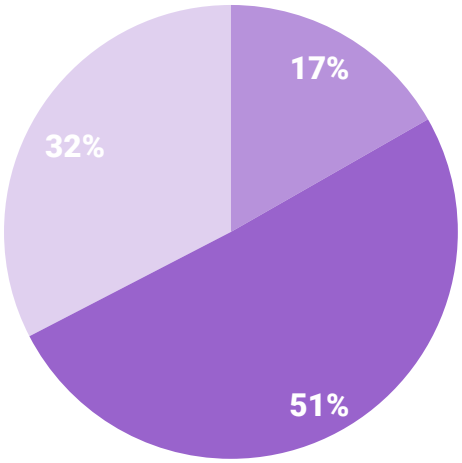


The study established a notable trend wherein it was observed that following the flood, a significant number of girls from all ten affected schools withdrew. This increase in withdrawal rates is primarily attributed to the socio-economic vulnerabilities exacerbated by the flood.

on average across all ten schools, the study found that there was a 17% dropout rate among girls, a 32% change in performance, and a 51% decline in attendance following the 2022 flood. The primary reason behind these changes appears to be the socio-economic impact of the flood.

Average dropout, attendence decline, and performance change in all ten schools





Of the factors contributing to girls' education disruption caused by the 2022 flood in Lasbela financial constraints emerge as the predominant factor, accounting for 68% of the disturbance. This indicates that vulnerable families faced significant challenges due to financial constraints, directly impacting girls' primary education.

The study's statistics vividly illustrate the profound impact of the 2022 flood on girls' primary education in Lasbela. Attendance disruptions, changes in performance, and increased dropout rates highlight the severe challenges girls face in accessing and sustaining their education following climate-related disasters.

These findings highlight the inadequacy of existing policy frameworks, such as the Framework for Implementation of Climate Change Policy (2014-2030), which primarily focus on short-term initiatives like local water harvesting and curriculum integration. Without addressing the financial impacts of climate change on vulnerable families, these policies risk overlooking the root causes of educational disruption and perpetuating systemic inequalities.

POLICY RECOMMENDATIONS

1. Prioritizing and integrating girls' education into climate change policy: Federal and provincial governments can develop more robust strategies to support girls' educational access and retention in the face of climate-induced challenges. There is an urgent need of interdisciplinary collaboration between climate scientists, educators, and policymakers to ensure holistic and effective responses to climate change impacts on education.

2. The National Climate Change Policy (NCCP) recognizes the disproportionate impact on women and those below the poverty line, focusing primarily on enhancing coping capacities. This includes developing a climate change curriculum for higher education within the formal education system. However, limitations in the Framework for Implementation of Climate Change Policy (2014-2030) are noted, particularly in short-term initiatives like local water harvesting and curriculum integration in the education sector. Furthermore, the effectiveness of bodies such as the Pakistan Climate Change Council and Authority in addressing the educational implications of climate change under the Climate Change Act 2017-2025 requires further exploration.

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PAPER 4:TEXTUAL TO PRACTICAL CLIMATE EDUCATION: ENHANCING STUDENT-TEACHER CAPACITY IN ADOPTING CLIMATE PROTECTION STRATEGIES

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OVERVIEW

The study propounds and advocates for Climate education to be recognized as a fundamental component of the academic curriculum, ensuring that students develop a comprehensive understanding of climate issues and the skills necessary to address them effectively. educators should be provided with training and resources to facilitate experiential learning opportunities, rearing a generation equipped to tackle the challenges of climate change head-on.

The research investigates climate education in government and private schools of Bahawalpur division, among students of class 4 to 8 and teachers, focusing on bridging the gap between theoretical and practical knowledge

The study investigated assessed the strengths, weaknesses, and areas for improvement within the curriculum taught at primary level at Bahawalpur district. It addresses the gap between theoretical climate knowledge and practical readiness in both Punjab government and private schools.

By examining these aspects comprehensively, the study intends to offer actionable policy recommendations aimed at enhancing the educational environment. These recommendations are designed to ensure that students are adequately prepared to confront and mitigate climate challenges throughout Punjab.

METHODOLOGY

This research uses a mixed-method approach to assess students' understanding of concepts related to climate, their practical implications, teaching methodologies, and challenges faced by teachers.

A total of 14 schools were selected to gauge students' understanding of climate related concepts and instructional approaches. A structured survey was conducted among a sample of students in grades 6 to 8, drawn from both government and private schools

in the Bahawalpur division. A random sampling technique was employed to select participants from the identified 14 schools, with 240 male and female students completing the questionnaire.

The questionnaire was developed based on climate-related chapters from the curriculum for grades 6 to 8 as per the Single National Curriculum. A checklist was devised after thorough analysis and was translated into Urdu. It included inquiries aimed at evaluating students' knowledge of climate change, their capacity to implement learned concepts in real-life situations, and their engagement in activities related to climate as outlined in their textbooks.

A total of 15 focus group discussions were conducted, involving male and female students from both school types. Additionally, five unstructured interviews were conducted with geography and science teachers.

Quantitative data analysis utilized T-tests, descriptive statistics, and psychometric scales to measure scale, mean, median, and relationships among variables, conducted using the Statistical Package for the Social Sciences (SPSS) software. Qualitative data analysis involved coding and interpretation with NVivo software, extracting themes and insights from focus group discussions and interviews.

RESULTS AND DISCUSSIONS

The study found the following issues as core themes for lack of quality climate education in the district:

1. Curriculum and Resources Teachers in both types of schools primarily use low-cost or no-cost materials to teach climate-related topics, lacking sufficient access to audio-visual aids. Dependence on alternative textbooks and limited resources underscores systemic issues within the education sector, including budget constraints and scarcity of resources. Inadequate access to updated materials compromises the quality and impact of climate education across schools, highlighting the urgent need for reforms, increased investment in educational resources, and a higher budget allocation.

2. Teaching Approaches opportunities for hands-on or experimental learning were found to be scarce, particularly for younger students in grades 1 to 3, due to deficiencies in textbook content. The reliance on textbook-based instruction reflects a traditional pedagogical approach that may not fully engage students or promote a thorough understanding of climate-related concepts. The limited availability of hands-on learning experiences further constrains students' ability to apply theoretical knowledge in practical contexts, potentially compromising their overall educational development.

3. Teacher Training and Support: Teachers in both government and private schools lack specialized training or specific guidelines for teaching climate education. Although they participate in general training sessions occasionally, there is a significant lack of targeted support aimed at improving climate education instruction. The absence of specialized training or guidelines highlights a deficiency in professional development opportunities for teachers to effectively integrate climate education

into their curriculum. Without adequate support and guidance, teachers may find it challenging to incorporate innovative teaching methods or stay abreast of the latest advancements in climate science and education.

4. Student Engagement and Evaluation: Climate education is inadequately integrated into both private and government schools, with limited informal discussions and activities. Although tree plantation drives are implemented as a best practice in environmental protection, student participation often lacks a deep understanding of the underlying environmental issues. Moreover, there is no formal assessment of how climate education impacts students' comprehension or actions in either school type. Without clear metrics to gauge learning outcomes, identifying areas for enhancement and ensuring the overall success of climate education programs becomes challenging.

5. Policy and Support from Educational Authorities Teachers in both government and private schools emphasize the need for updated textbooks and the enforcement of existing policies to enhance climate education. They cite challenges including outdated materials, limited resources, and insufficient support from educational authorities.

During the focus Group discussion Private school students demonstrate a stronger sense of environmental responsibility, likening it to caring for their own home, whereas government school students show a basic understanding with less personal connection. In terms of observing weather changes, students from both types of schools note extreme temperatures and unusual weather patterns, but private school students display greater awareness of challenges like pollution and habitat destruction. When it comes to actions for conservation, private school students suggest more proactive and comprehensive measures, while government school students focus on basic cleanup efforts.

These concerns highlight the critical need for systemic reforms to promote effective climate education. Addressing issues such as curriculum modernization, resource allocation, and professional development opportunities for teachers requires collaborative efforts among policymakers, educators, and stakeholders. This collective approach is essential for establishing a stronger framework to integrate comprehensive climate education into school systems.

POLICY RECOMMENDATIONS

1. **Investing in quality Climate Change Education (CCE):** Through partnerships, networking, and media, the programme enhances governments' ability to deliver high-quality Climate Change Education (CCE), knowledge sharing, policy guidance, and support for creative thinking and non-formal education initiatives (Education for Sustainable Development, 2023). although books of Single National Curriculum incorporate chapters related to environment and climate in every subject but the content needs to be more comprehensive and updated.

2. **Tailored Educational Approaches to address gender gap in learning:** Develop tailored educational approaches to bridge gender differences in attitudes towards Climate Education, ensuring that teaching methods and materials aligns with all students, regardless of gender or cultural background.

3. **Curriculum Improvements and Implementation:** Prioritize curriculum improvements, especially in the implementation of climate-related topics, by revising curriculum frameworks to integrate comprehensive climate education content and supporting teachers with resources and training.

4. **Focused Teacher Training Programs:** Provide focused teacher training programs to equip educators with the knowledge, skills, and resources needed to effectively teach climate-related topics, covering content knowledge, instructional strategies, assessment methods, and classroom management techniques.

5. **Collaboration with Stakeholders:** Foster collaboration with relevant stakeholders, including government agencies, educational institutions, non-profit organizations, and community groups, to develop and implement comprehensive climate education initiatives that address the needs of diverse learners and communities.

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THEME: INFRASTRUCTURE & LIVELIHOOD

SMOG GOVERNANCE: ASSESSING THE IMPACT OF SMOG ON AIR QUALITY: A CASE STUDY OF LAHORE.

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OVERVIEW

This study examines smog related challenges in Lahore, Pakistan, while emphasizing its sources, health, economic and infrastructural impacts and suggesting innovative and successful practices in the mitigation of smog. Quantitative Air Quality Index data collected by the study indicated that industrial zones experience the highest levels of smog during winters, while agricultural areas show the lowest AQI. The research reveals that smog significantly impacts health and presents a substantial socio-economic challenge for Lahore's residents. Immediate action to reduce industrial emissions, active community involvement, and effective enforcement measures are crucial. The study underscores the need for evidence-based approaches and collaboration with stakeholders and the public to address smog pollution and promote sustainable development in Lahore.

The exorbitant rise in automobiles, unchecked deforestation, expeditious urbanization, and the unabated growth of industries in Labore have contributed to this alarming situation over the years.

The existing body of literature mainly emphasizes advocating for new laws to tackle smog. However, it often overlooks the importance of identifying and addressing gaps in existing policies. A thorough analysis of the research highlights the need to shift focus from proposing new legislation to prioritizing the effective implementation of already-established laws. This approach underscores the necessity of not just creating policies but ensuring their execution to effectively combat smog-related challenges

METHODOLOGY

Mixed research methodology is used in this research to thoroughly study both the quantitative and qualitative data to suggest evidenced based solutions to address the smog related challenges in Lahore. The quantitative part of this research analyzes the patterns of smog in different areas of Lahore with the variation of seasons. The qualitative part of the research studies current literature, analyzing stakeholder viewpoints, and evaluating public opinions related to the smog and environmental challenge in Lahore. the study used SPSS and STATA for statistical analysis.

Four AQI devices were installed in various locations to analyze air quality patterns. One device was placed in an industrial zone (Sundar-Raiwind Road), another in an institutional area (Anargalli, Old Lahore), one in a residential area (Canal town, Gullberg), and the fourth in an agricultural region (UET Lahore). Every day, collected data from these devices at various intervals to gain a comprehensive understanding of the variations in air quality across these zones. During the quantitative phase of the study a thorough examination of smog patterns was conducted by using air quality monitoring devices. the AQI of all four

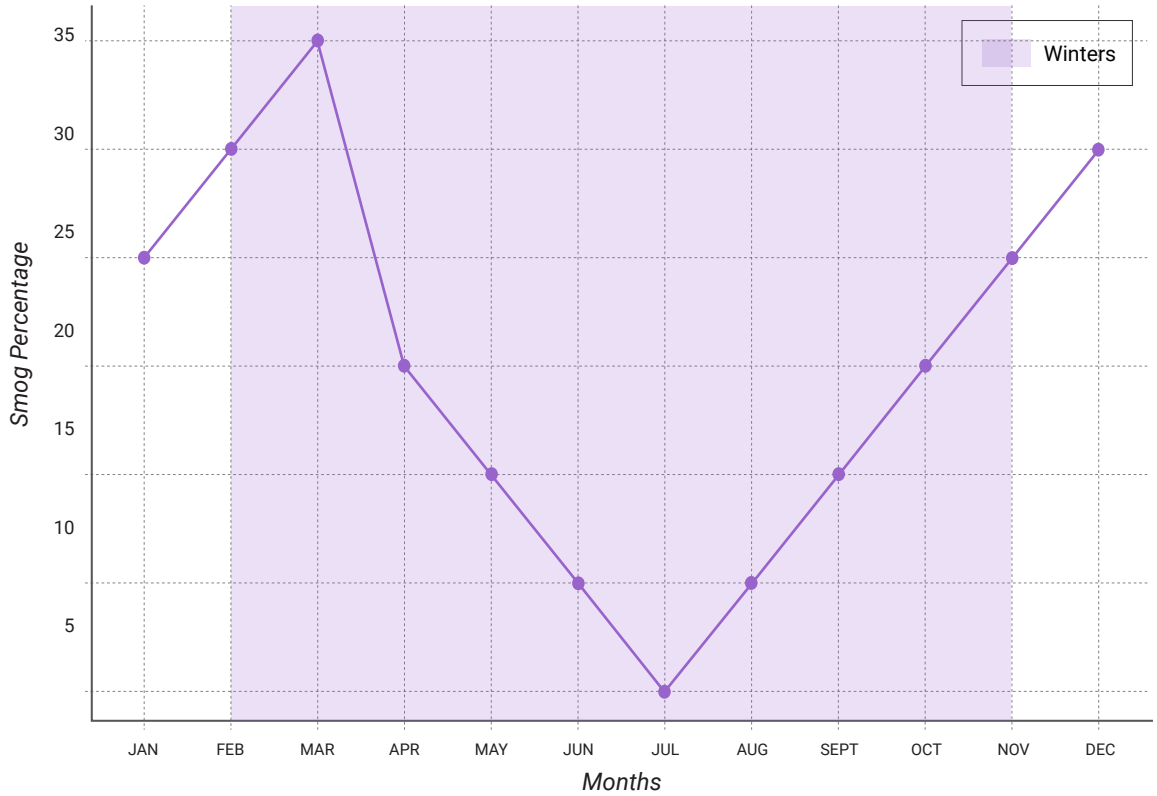
seasons: autumn, winter, spring, and summer were analyzed and the data was collected from the online site of the environmental protection and climate change department, government of Punjab.

For FGD at least 30 females were included due to their increased susceptibility to the health impacts of smog. For the second FGD, a group of around 20 farmers was brought together to explore the common belief that smog is connected to the burning of agricultural residue. The third FGD involved at least 10 stakeholders or personnel who are responsible for implementing measures to control smog.

RESULTS AND DISCUSSIONS

Over a six-month period, air quality data from Lahore was analyzed across various zones, including Industrial, Institutional, Residential, and Agricultural areas. The findings reveal distinct patterns and significant differences in pollution levels. The graph shows a worrying decline in air quality during the winter months, especially in December and January. The Industrial zone consistently shows higher air pollution levels compared to other areas, with AQI frequently exceeding healthy limits. This indicates that intensive industrial activities significantly contribute to Lahore's smog problem.

Smog Patterns in Lahore (Simulated Data)



The observed trends highlight the need for specific interventions and policies to reduce smog pollution, especially in winter when air quality often worsens. More research and gathering of detailed data are necessary to develop effective strategies to tackle and reduce the problems caused by smog in Lahore.

The study compared industrial, residential, institutional and Agricultural zone and found that the industrial zone exhibits the greatest variation in median air quality. The air quality in the industrial zone experiences greater variations compared to other zones. The

medians and ranges of the Residential and Institutional zones were found to be quite similar, with slightly less variation in the Residential zone. The Agricultural zone had the lowest median and the smallest quartile range, suggesting that there is less variation and potentially more stable air quality throughout the measurement period.

The study revealed severe health effects of smog on Lahore's residents. Stakeholders interviewed for the study expressed concerns about air pollution's negative impact on respiratory health, noting increased rates of asthma, bronchitis, and other respiratory illnesses. Vulnerable groups, such as children, the elderly, and those with pre-existing conditions, were highlighted as especially affected. Stakeholders shared personal experiences of breathing difficulties and discomfort during high pollution levels. Beyond respiratory issues, they also discussed the exacerbation of cardiovascular diseases, allergies, and skin irritations. Emphasis was placed on the urgent need for public health measures to address these growing health issues.

Despite numerous governmental laws and policies aimed at controlling smog in Lahore, there is a significant gap in their implementation. This is due to inefficient policy enforcement, lack of accessible smog-related information, and absence of community-friendly mitigation strategies. To address this, government institutions need to enforce policies more effectively and ensure information is easily accessible to Lahore's residents. Additionally, strategies should be developed that are socio-culturally accepted and practiced.

POLICY RECOMMENDATIONS

Based on the extensive exploration of smog-related challenges in Pakistan, several key recommendations emerge to combat and alleviate the detrimental impacts of this environmental issue.

1. **Policy Enforcement:** Robust policy enforcement developed through collaborative efforts among governmental bodies, tech industries, and research institutions will guide sustainable interventions. The introduction of stringent regulations are imperative, particularly focusing on reducing vehicular emissions in urban centers like Lahore through the promotion of public transportation and incentivizing eco-friendly vehicles.

2. **Encouraging use of renewable energy:** targeting industrial emissions, especially from sectors like brick kilns, demands the implementation of green industrial policies and cleaner technologies to curb pollution output. Encouraging the adoption of renewable energy sources within industrial and domestic sectors could significantly diminish smog-causing emissions. Public awareness campaigns and educational programs must be intensified to inform and engage citizens about smog hazards and encourage behavioral changes.

3. **Employing AI to monitor Air quality:** Establishing a comprehensive network of monitoring stations and electric vehicle charging points across the city will be pivotal in expanding smart infrastructure.

4. **Innovative public engagement strategies:** such as gamification and augmented reality applications, must be emphasized to disseminate accessible and engaging smog-related information across diverse communities

5. **Promoting knowledge exchange:** Prioritizing educational programs, research initiatives, and global partnerships will foster knowledge exchange, nurturing a culture of innovation and informed decision-making for a cleaner and healthier Lahore environment.

It is crucial to implement effective policies that target industrial emissions. These policies should be accompanied by stronger enforcement measures and strategies to engage the community. By giving importance to policy coherence, working together with stakeholders, and making decisions based on evidence, policymakers can create thorough strategies to address smog pollution and encourage sustainable development.

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THEME: LIVELIHOOD

EXPLORING CLIMATE CHANGE ADAPTATION STRATEGIES AND LIVELIHOOD TRANSITION IN URBAN INFORMAL SETTLEMENTS VULNERABLE TO SEA LEVEL RISE IN DIST BADIN, SINDH

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OVERVIEW

The study focuses on the role of communities in developing infrastructure to enhance climate resilience in urban informal settlements. Through public opinion surveys and thematic analysis, key themes emerge, highlighting community-based projects, government interventions, and policy recommendations. The findings emphasize the importance of community participation in decision-making, the meaning of sustainable infrastructure development, and the necessity for government policies addressing climate issues. The discussion chapter underscores the significance of contributing to current literature to develop evidence-based practices and policies involving community outreach strategies. Policy recommendations outline elements to improve the climate resilience of urban informal settlements. This study addresses gaps in guidance on effective techniques, providing essential knowledge for policymakers and practitioners in climate adaptation and urban development.

"The recent extreme weather events in Sindh have urgently brought climate resilience measures to the forefront of the government agenda. The 2022 floods, considered Pakistan's most devastating monsoon in recent history, wrought havoc with severe flooding and widespread displacement, predominantly affecting the southeastern province of Sindh (Wahab, 2022). The unprecedented intensity and prolonged duration of the rains exceeded historical averages, submerging urban areas, devastating agricultural lands, and disrupting livelihoods (World Bank, 2023)

Climate change is posing new challenges to residents of informal urban settlements, compelling them to adapt to evolving conditions. Traditional livelihoods such as agriculture, fishing, and small-scale trade are increasingly unsustainable due to climate variability and economic instability (Scheffran et al., 2019). Consequently, many residents are diversifying their sources of income and forming community groups to enhance resilience (Scheffran et al., 2019).

For instance, coastal communities reliant on fishing face declining stocks and reduced incomes, prompting some fishermen to switch to alternative livelihoods like boat repair, carpentry, and public transport (Scheffran et al., 2019). Similarly, women in urban slums are establishing micro-businesses and self-help groups to generate income and support their families amidst economic uncertainties (Scheffran et al., 2019)."

METHODOLOGY

The study employed single-method design.

RESULTS AND DISCUSSIONS

The respondents emphasize the importance of education and capacity building in enhancing climate change adaptation in urban informal settlements. They propose launching training programs, newspaper ads, and social media campaigns aimed at educating community members about climate literacy and sustainable methodologies. Emphasizing policies that prioritize education and skill development is seen as crucial for building adaptive capacity and ensuring sustainable practices within these communities.

Furthermore, the respondents underscore the necessity of social inclusion and equity in climate adaptation strategies. They advocate for policies that establish gender-responsive procedures, foster community participation, and ensure inclusive governance structures. Addressing social vulnerabilities and enhancing community cohesion are viewed as essential components for building resilient communities capable of effectively managing climate challenges.

Innovation and modern landscaping are highlighted as pivotal tools for improving living conditions in harsh climatic environments within urban informal settlements. Participants stress the importance of research, green technologies, and innovative adaptation strategies tailored to local contexts. They advocate for initiatives that promote innovation, such as issuing research grants and establishing innovation hubs at the local level, to foster context-specific solutions and enhance resilience.

Disaster risk reduction remains a global priority, particularly for urban informal settlements. Policies focusing on early warning systems, community-based disaster preparedness, and resilient infrastructure frameworks are deemed critical for mitigating climate change-related disasters. Strengthening collaboration among stakeholders and supporting effective disaster management systems are essential for enhancing adaptive capacities and reducing vulnerabilities.

Creating sustainable livelihoods is identified as key to resilience in urban informal settlements. Experts emphasize activities like ecotourism, sustainable farming, and small businesses as means to reduce dependence on vulnerable ecosystems and foster economic stability. They advocate for government policies that promote green jobs, microfinancing, and entrepreneurship to bolster economic resilience and reduce vulnerability to climate impacts.

Finally, ensuring good governance and transparency is considered indispensable for effective climate adaptation in urban informal settlements. Participants stress the importance of district administration models, community involvement, and transparent decision-making processes. Policies that promote accountability, public participation, and stakeholder engagement are crucial for fostering fair and sustainable resilience-building efforts in these communities.

POLICY RECOMMENDATIONS

Mobilizing and empowering communities' Local community-based adaptation efforts can strengthen the resilience of urban informal settlements and foster social cohesion within their networks. Grassroots organizations and local civil society can facilitate community participation and empowerment at the local level, thereby enhancing adaptive capacity for sustainable development.

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THEME: RESILIENT COMMUNITIES

A GENDER-SENSITIVE APPROACH TO CLIMATE RESILIENCE FOR WOMEN-LED FAMILIES IN LASBELA, BALOCHISTAN

CONTRIBUTOR Abrar Ronjha | *abrar.roonjha@gmail.com*

OVERVIEW

This study examines the resilience of women-led families in Lasbela, Balochistan, against climate-induced disasters, with a focus on the 2022 monsoon floods. It aims to identify gender-sensitive policy interventions that can enhance their capacity to withstand and recover from such events. Addressing the gap in Balochistan's climate policy, the research seeks to contribute to the development of a comprehensive, gender-inclusive climate adaptation framework that recognizes the unique vulnerabilities and strengths of women-led households.

The 2022 monsoon floods in Lasbela, Balochistan, underscored the acute vulnerability of women-led families to climate disasters, revealing significant challenges rooted in social, economic, and educational barriers.

The research dissects the essential components of resilience for these floods effected families, proposing targeted policy recommendations while advocating for the development of a gender-sensitive climate policy in Balochistan, emphasizing economic empowerment, disaster risk reduction, healthcare access, and educational opportunities. This study not only contributes to the discourse on gender and climate change but also paves the way for actionable insights into fostering resilience among the most vulnerable populations in the face of escalating climate threats.

The 2022 floods in Lasbela not only transformed landscapes but also reshaped lives, particularly those of women who navigate economic constraints and cultural norms while leading their families. This disaster highlighted a stark reality: the disproportionate impact of climate crises on resilient yet vulnerable communities. Existing research often overlooks the intersections of gender, socio-economic status, and environmental distress in regions like Lasbela. The instant study aims to fill this gap by uncovering untold stories and addressing unexplored challenges. Through this research, drawn from a scarred yet enduring landscape.

The findings from the analysis, particularly regarding the socio-economic and educational status of women-led families align with Kumar & Sharma (2023) and Islam & Kabir (2023), underscoring the compounded vulnerabilities faced by women in patriarchal and socio-economically disadvantaged settings during climate disasters

METHODOLOGY

This mixed-methods study, involving 212 participants including affected families, local youth, and NGO workers. The study analyzed data from 15 women-led families, comprising a total of 83 family members, reflecting the demographic composition of households in Lasbela affected by the 2022 monsoon floods.

In-depth interviews and focus group discussions (FGDs) provided rich narrative data from women-led families directly affected by the floods, local youth, and NGO workers involved in the disaster response. This qualitative component offered invaluable insights into their lived experiences, coping mechanisms, challenges faced, and the perceived efficacy of support systems. Thematic analysis was used to identify recurring themes and patterns within this data, facilitated by premium AI software for efficient and accurate interpretation.

Surveys were conducted to gather quantitative data on the floods' impact on housing, livelihood, and health, complementing the qualitative findings with a statistical basis for understanding the disaster's effects and community resilience strategies. Microsoft Excel was used for organizing and analyzing this survey data, ensuring detailed and objective evaluation. Ethical guidelines were rigorously followed, with informed consent obtained from all participants and anonymity and confidentiality maintained to protect respondents' privacy.

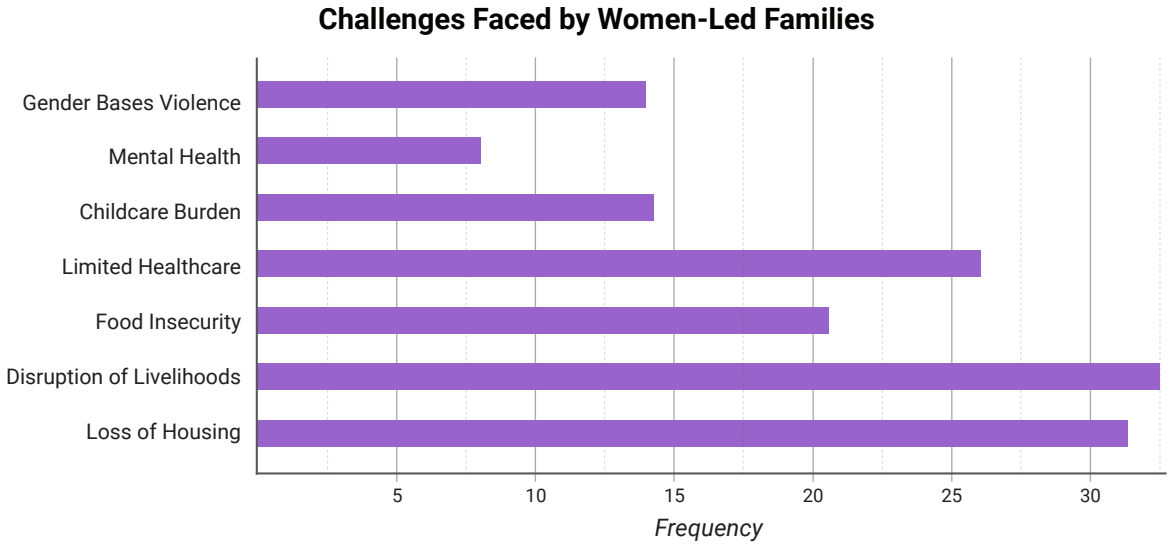
RESULTS AND DISCUSSIONS

A significant number of families surveyed i.e. 73.3% experienced high to very high damage to their homes due to the floods.

Over half (53.33%) reported very high damage to their belongings, underscoring the extensive material loss.
The research also revealed a striking 93.33% faced moderate to very high impact on their livelihoods, highlighting the economic fallout

Additionally (93.34%) of those surveyed experienced high to very high effects on their family's health, indicating severe well-being concerns

Interestingly 60% respondents found NGO aid to be low to moderate in effectiveness. On the other hand, a vast majority (93.33%) rated government support as low to very low, pointing to significant dissatisfaction.

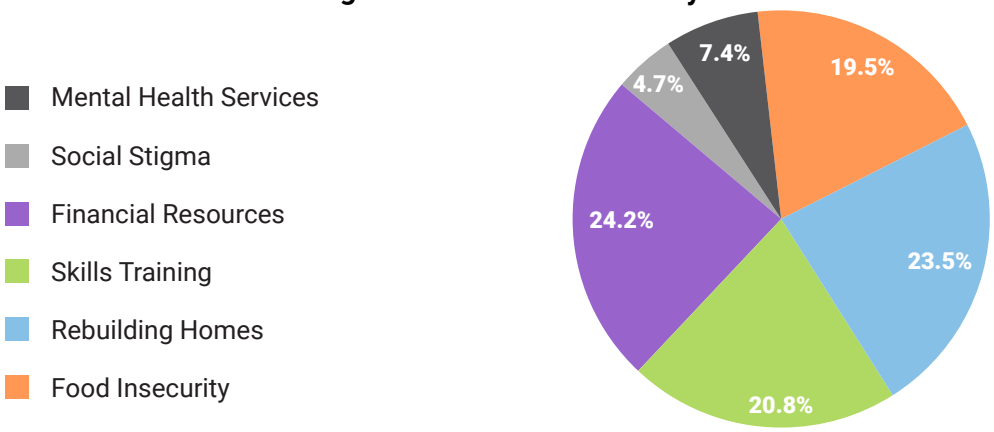


Disruption to livelihood stood out as the core issue effecting women led familied in the survey of NGO workers followed by loss of housing and limited healthcare.

A significant portion of NGO workers view women-led families as more severely impacted, advocating for targeted intervention strategies.

The graph in the study Identifies the primary recovery challenges to be lack of financial resources and difficulty in rebuilding homes, coupled with the need for skills training and employment opportunities.

Challenges in Post-Flood Recovery



POLICY RECOMMENDATIONS

1. Provincial Climate Change Policy: Develop a policy that incorporates Balochistan's unique environmental, socio-economic, and geographical characteristics into the broader framework of Pakistan's National Climate Change Policy. This policy should prioritize gender inclusivity, ensuring that women's experiences and needs are central to the formulation of climate adaptation and resilience strategies.

2. Community-Based Initiatives: Implement initiatives that empower local communities, especially women, to actively participate in developing solutions. These initiatives should focus on water conservation, sustainable agriculture, and disaster risk reduction, all of which are essential for enhancing local resilience

3. Investment in Climate Resilience: Prioritize investments in climate-resilient infrastructure, such as water management systems, agricultural support, and urban planning designed to withstand extreme weather conditions. These investments should directly enhance and benefit women's livelihoods and well-being.

4. Encourage Women's Access to Renewable Energy Resources: Promote the use of renewable energy sources and enhance energy efficiency as key strategies to reduce dependency on fossil fuels. Implement specific programs designed to support women's access to and utilization of these technologies. This includes economic empowerment programs for women, enabling them to lead in resilience efforts.

5. Public-private partnerships: Public private JVs that invest in climate-resilient development projects, including sustainable agriculture and water-saving technologies, should prioritize benefits for women-led households.

6. Integrating and Prioritizing Women's Needs: Ensure that climate change considerations are integrated into all levels of planning and policy-making, making climate resilience a core element of development strategies. Women's needs and resilience strategies should be prioritized and placed at the forefront of these efforts

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THEME: AGRICULTURE

INTEGRATED NUTRIENT MANAGEMENT (INM) AND INTEGRATED PEST MANAGEMENT (IPM) AS PAKISTAN`S ROADMAP TO CLIMATE-SMART AGRICULTURE POLICIES

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OVERVIEW

Pakistan's agriculture sector, crucial to its economy, faces immense pressure from the escalating climate crisis. The predominantly rain-fed system is particularly vulnerable to increased droughts, floods, and heat stress (Dehlavi et al., 2015).

Pakistani crops are highly sensitive to temperature and water fluctuations, with projected temperature rises expected to reduce yields by 8% to 10% (Dehlavi et al., 2015). Extreme heat events over 35°C further exacerbate this vulnerability, particularly affecting crops like rice, sugarcane, maize, and soybeans, leading to significant yield declines (Yu et al., 2013; Porter, 2019).

The study suggests Integrated Nutrient Management (INM) and Integrated Pest Management (IPM) as key components of Climate-Smart Agriculture (CSA) strategies, aimed at enhancing productivity, resilience, and sustainability (Hafeez et al., 2022). However, their adoption in Pakistan is limited due to factors like low awareness, lack of technical guidance, and economic constraints (Bashir et al., 2016).

The study evaluates the current adoption of Integrated Nutrient Management (INM) and Integrated Pest Management (IPM) practices in Pakistan's agriculture sector, investigate the impact of climate variations on pest prevalence and nutrient needs across different regions, identifies key challenges to integrating INM and IPM strategies into agricultural policies, and assess the effectiveness of existing policies in addressing climate change-related challenges while focusing on policy gaps and areas for improvement.

METHODOLOGY

The study used a mixed methods approach, The research involved a structured household survey of a representative sample of 100 farmers including women in District Upper Dir, Pakistan, to gather quantitative data on their agricultural practices, awareness of INM and IPM principles, adoption rates, and perceived barriers. Using stratified random sampling, participants were selected from various areas within the district to ensure diverse representation.

Qualitative data was collected through focus group discussions and in-depth interviews with key agricultural stakeholders. Three focus groups, each with about 15 participants, included farmers, extension workers, and policymakers from different villages in District Upper Dir to explore their views on INM, IPM, and climate change adaptation. Additionally, 40 in-depth interviews were conducted with government officials, farmers, agricultural experts, extension workers, and private stakeholders.

Quantitative data was analyzed using descriptive, correlation, and regression analysis with SPSS to identify patterns and associations. Qualitative data was analyzed through thematic analysis to uncover recurring themes and insights from focus group discussions and interviews.

RESULTS AND DISCUSSIONS

Quantitative results from the study reveal that farmers in District Upper Dir have moderate to high levels of understanding and adoption of INM and IPM practices. However, the findings also indicate low educational levels among farmers, highlighting the need for region-specific educational programs that effectively disseminate information rather than just providing resources.

Though the study data shows a moderate to high understanding and use of INM and IPM practices among farmers, however, qualitative insights highlight challenges such as lack of human capital and state support. These findings stress the need for targeted interventions to increase adoption rates and overcome implementation barriers.

Regional differences in pest prevalence and nutrient requirements due to climatic variations highlight the necessity for flexible, climate-smart agricultural strategies. Both data types underline the link between climate resilience and the adoption of sustainable practices.

Barriers to integrating INM and IPM strategies into national policies include farmer ignorance, insufficient technical capacity, and lack of institutional support, as confirmed by both qualitative and quantitative data. Addressing these issues is essential for effective policy implementation.

Evaluating current agriculture policies reveals inadequacies in addressing climate-induced challenges in pest and nutrient management. While quantitative analysis shows policy execution gaps, qualitative assessments highlight issues of policy coherence, stakeholder ownership, and resource allocation, underscoring the need to enhance policies for sustainable and resilient agriculture.

A key theme from the qualitative analysis was found to be the critical need for knowledge and understanding of sustainable agricultural practices. Stakeholders emphasized the importance of information dissemination to spread INM and IPM technologies. They called for greater access to teaching materials and programs on these practices. Both farmers and agricultural extension workers stressed the need for targeted awareness campaigns to highlight the benefits of INM and IPM, followed by community-level capacity building.

POLICY RECOMMENDATIONS

1. Invest in farmer training on INM and IPM: educate farmers about the benefits of INM and IPM techniques, initiate targeted awareness campaigns emphasizing their role in enhancing crop output, mitigating climate change impacts, and reducing reliance on chemical inputs. Utilize diverse platforms like farmer cooperatives, extension services, and community-based organizations to maximize outreach.

2. Capacity building prioritizing capacity-building programs is essential to equip farmers with the skills and knowledge needed to effectively implement sustainable farming methods. This includes training in soil health management, climate-resilient agriculture, and tailored INM and IPM practices suited to diverse geographical conditions.

3. Strengthen institutional support: To promote grassroots adoption of INM and IPM practices, strengthen institutional support systems by expanding access to quality inputs, promoting advanced technologies, and providing financial incentives and subsidies.

4. Agriculture Policy: changes in the agriculture policy are essential to create a supportive environment for sustainable agriculture. This involves establishing regulatory frameworks to promote the use of organic fertilizers and biopesticides, integrating INM and IPM principles into national agricultural policies, and implementing targeted interventions to encourage farmers to adopt climate-smart agricultural practices.

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THEME: HEALTH-MENTAL HEALTH & SRH

PAPER 1: ASSESSING POST-TRAUMATIC STRESS AND ANXIETY AMONG RURAL POPULATION AFFECTED BY CLIMATE-INDUCED DISASTERS

CONTRIBUTOR

John Yousef

OVERVIEW

This study investigates PTSD and anxiety prevalence among rural Pakistanis affected by climate disasters. A quantitative survey assessed symptoms in 40 relocated flood victims (75% female), revealing alarmingly high rates of PTSD (90%) and anxiety (95%), with females disproportionately affected. The discussion explores potential causes such as gender differences, pre-existing conditions, limited mental health services, socioeconomic factors, and the critical role of community support. These findings underscore the urgent need for comprehensive interventions to address the mental health burden on these communities, including bolstering social support, increasing mental health awareness, and ensuring equitable access to affordable care.

This research aims to assess the prevalence of post-traumatic stress and anxiety among rural residents affected by climate-induced disasters in Pakistan, examining variations across different regions and communities. It also seeks to identify contributing factors such as community support networks, socio-economic status, and access to mental health services. Additionally, the study explores coping mechanisms and resilience strategies used by rural populations to mitigate the mental health impacts of climate change, emphasizing community-based approaches and traditional knowledge systems.

Understanding the specific manifestations of post-traumatic stress and anxiety in rural populations is crucial for developing effective interventions. By illuminating the nuanced aspects of mental health in vulnerable communities, this research aims to inform policies and initiatives aimed at enhancing resilience and well-being amidst climate change-induced disasters. Addressing mental health challenges in rural areas is not only vital for individual well-being but also essential for fostering the resilience and sustainability of these communities amid ongoing environmental changes.

METHODOLOGY

The survey instrument utilized in this study incorporated standardized scales and questionnaires, including the PTSD Checklist for DSM-5 (PCL-5) and the Generalized Anxiety Disorder 7-item (GAD-7) scale (Smith & Brown, 2020). These tools were chosen to quantitatively assess the frequency and severity of PTSD and anxiety symptoms among respondents, offering valuable insights into the psychological effects of climate-induced disasters on rural communities.

Convenience sampling was employed as the sampling technique for this study, aiming to gather data efficiently from accessible populations within the affected rural areas. The sample size was 40 individuals.

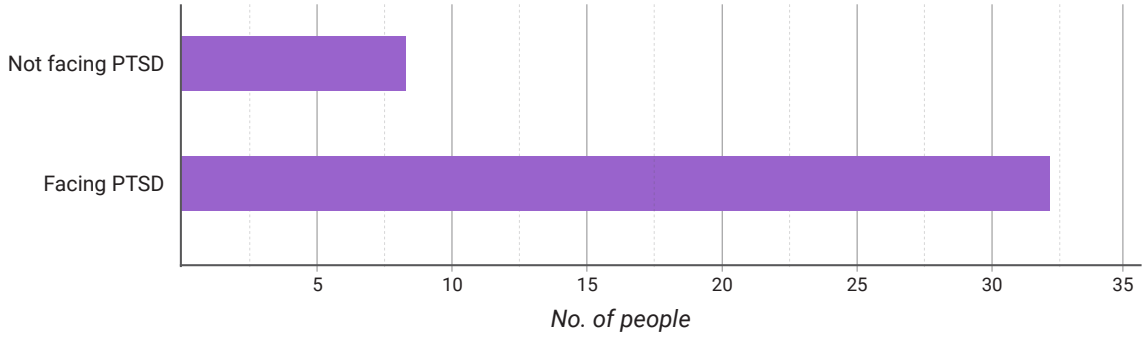
RESULTS AND DISCUSSIONS

The findings presented in this study paint a concerning picture of a population grappling with pervasive anxiety and post-traumatic stress disorder (PTSD). The overwhelming majority (95%) reported experiencing anxiety, with a significant gender disparity.

Females were found to be disproportionately affected.

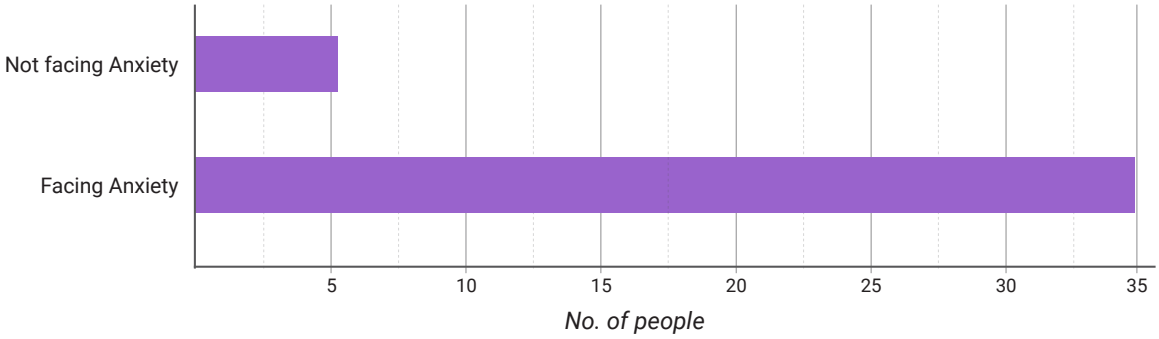
Furthermore, a staggering 90% of the population exhibited symptoms of PTSD.

Sample data: PTSD after flood devastation (n=40)



These results necessitate a deeper exploration of the underlying causes and potential interventions. This discussion chapter will delve into the identified factors influencing anxiety and PTSD levels, drawing upon relevant theories and research.

Sample data: Anxiety levels after flood devastation (n=40)

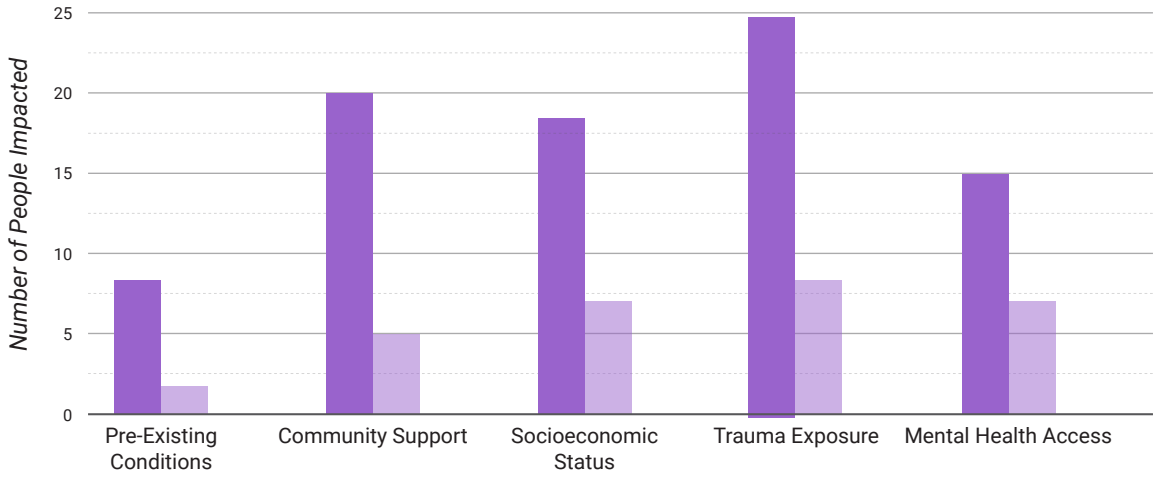


Of those surveyed a disturbingly vast majority reported facing anxiety post flood, many reported the inability to seek help as the contributing factor in anxiety, stress and depression.

The study highlights limited mental health access as a factor influencing anxiety and PTSD levels. This is a critical concern globally, as a significant portion of the population with mental health disorders remains undiagnosed and untreated (World Health Organization, 2018). Lack of access to effective interventions can lead to the chronicity of symptoms, causing significant functional impairment.

There was a general trend of helplessness amongst the surveyed population 62.5% of the population reported exposure to trauma as the flood destroyed their home, family and livelihoodto be the contributing factor in rising case of PTSD and anxiety amongst the flood effected population.

Factors affecting PTSD and Anxiety in Disaster-Affected Communities (n=40)



The high rates of anxiety and PTSD highlight the urgent need for comprehensive interventions. Addressing pre-existing conditions (Kessler et al., 2010), bolstering community support systems (Cohen & Wills, 1985), and enhancing mental health literacy are critical steps. Equally important is ensuring equitable access to affordable and effective mental health services.

Further research should focus on understanding the specific challenges faced by women in this study and developing targeted interventions. By addressing these complex factors, we can foster a more resilient and supportive environment that promotes the overall well-being of affected populations.

POLICY RECOMMENDATIONS

Community support network: Community support plays a crucial role in influencing levels of anxiety and PTSD. Extensive research consistently underscores the protective effect of strong social connections. Supportive social networks not only mitigate the impact of stress but also foster resilience in individuals facing trauma. Studies have shown that having access to supportive relationships and networks can significantly alleviate symptoms of anxiety and PTSD by providing emotional support, practical assistance, and a sense of belonging. These factors contribute to enhancing overall mental well-being and coping mechanisms in communities affected by adversity. Strengthening community support systems is therefore essential in promoting mental health resilience and recovery among individuals experiencing climate-induced disasters or other traumatic events.

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PAPER 2: THE SILENT STORM - HOW CLIMATE CHANGE SHAPES MENTAL WELL-BEING

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OVERVIEW

Eco-anxiety, a growing concept, encompasses the psychological distress individuals feel due to environmental concerns and climate change (Clayton et al., 2017). As climate change intensifies environmental challenges like biodiversity loss and natural disasters, people may experience increased levels of eco-anxiety, marked by feelings of helplessness and existential dread.

This study explores the intersection of mental health and climate change impacts in Badin, Pakistan, post-devastating floods, it comprehensively investigates experiences, perceptions, and support-seeking behaviors among those affected by these environmental stressors. The findings indicate significant associations between flood exposure and adverse mental health outcomes, coupled with heightened concerns about future climate-related risks. Social support emerged as pivotal in mitigating these effects, underscoring the importance of community resilience-building initiatives.

These findings are further endorsed by earlier researches wherein vulnerable populations, including low-income communities and indigenous peoples, were found to be disproportionately affected, exacerbating existing health disparities (Cunsolo & Ellis, 2018).

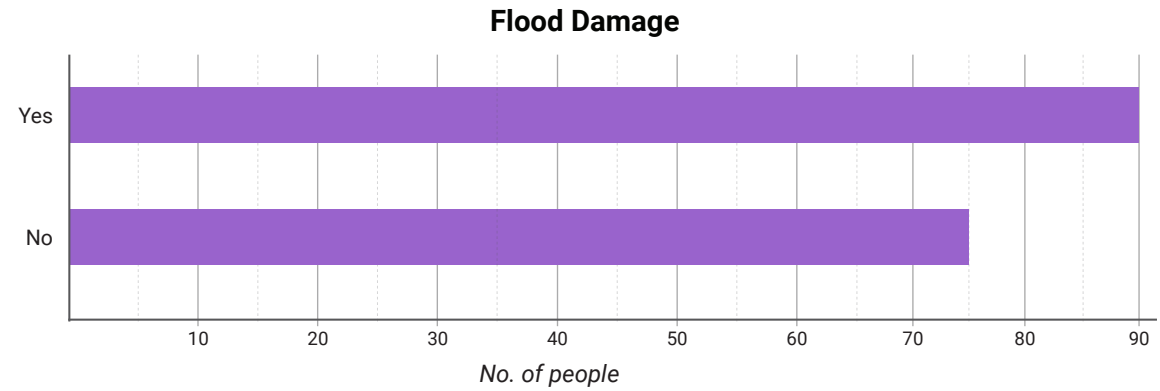
To counter the effect of climate change on mental health the study proposes the establishment of accessible and culturally sensitive mental health services in Badin is necessary to address the increasing psychological burden resulting from climate change-induced disasters. Community-based interventions, resilience-building activities, and awareness campaigns are crucial to promoting mental well-being. Additionally, integrating mental health considerations into climate adaptation policies and investing in capacity-building for healthcare professionals and community leaders will enhance responses to psychosocial needs during disasters.

METHODOLOGY

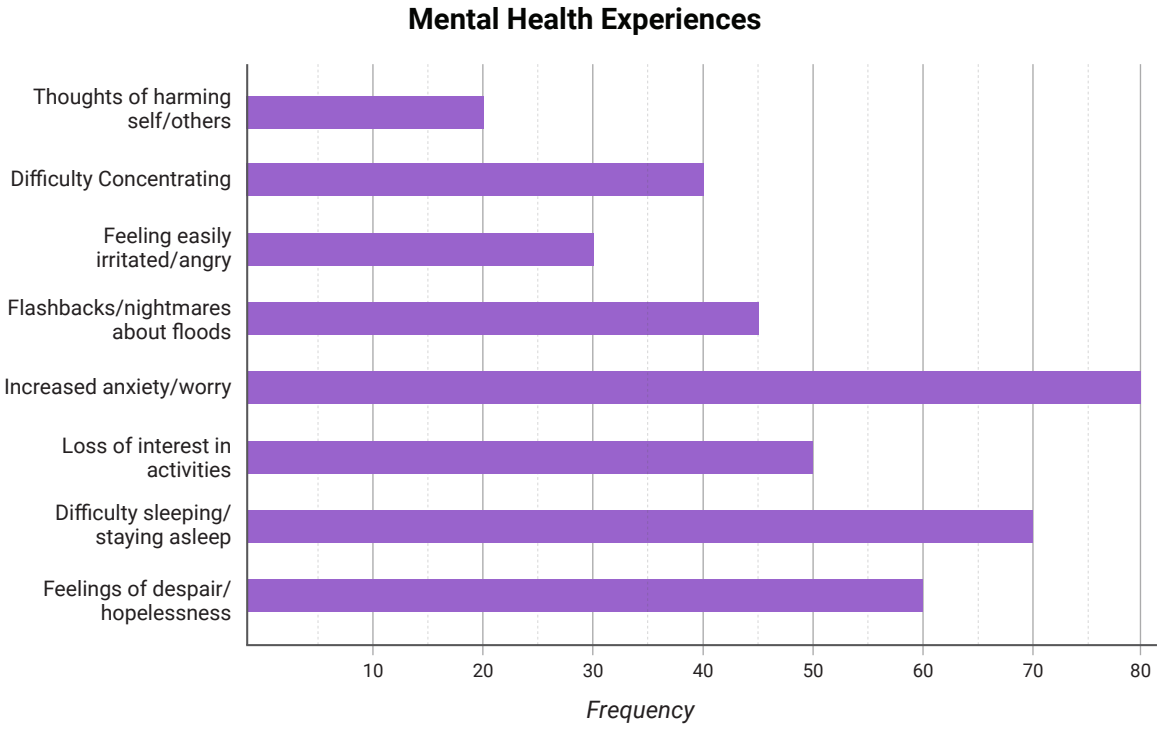
The research employed mixed methods approach, The methodologies used in this research include content analysis of interviews and frequency analysis of questionnaires. Content analysis of interviews involves systematically examining qualitative data from focus group interviews to uncover recurring themes, patterns, and key insights related to climate change and mental health.

RESULTS AND DISCUSSIONS

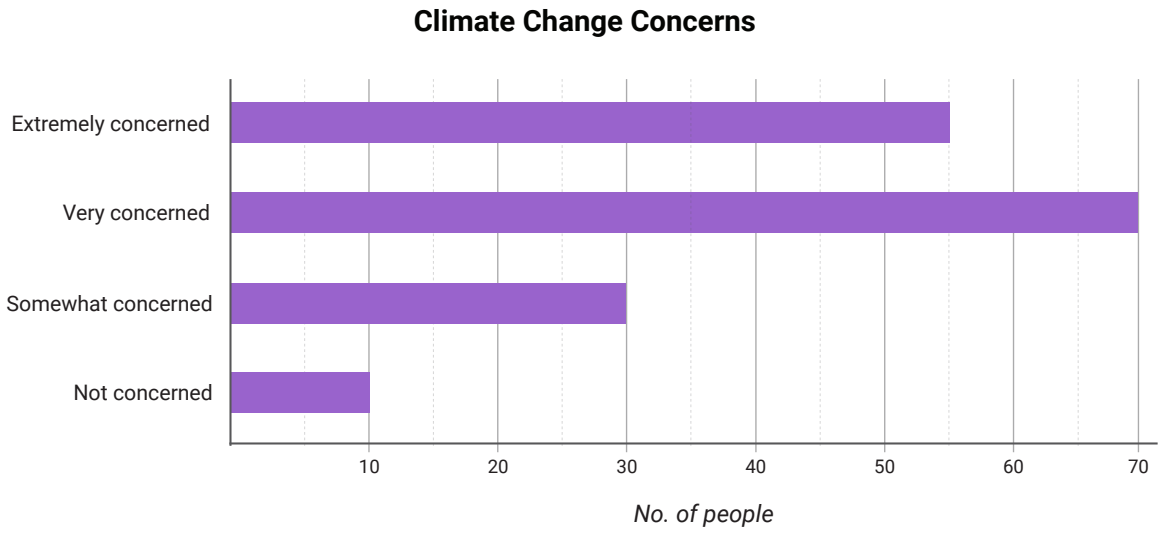
43% of the respondent of the research survey were in the age bracket 18-24 with equal representation of genders.



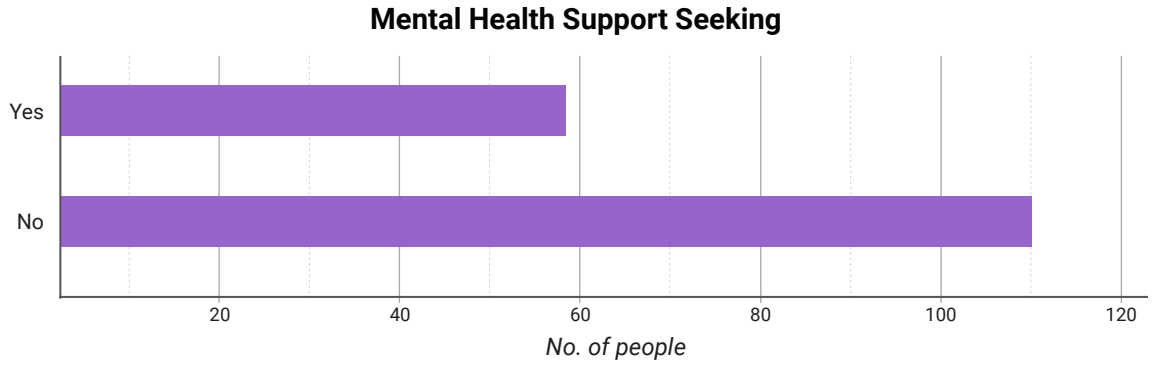
The study reveals that a significant portion (60%) experienced damage to their homes or belongings during the floods, underscoring the extensive impact on the community's physical and psychological well-being. It is crucial to provide comprehensive mental health support services to effectively address trauma and aid in recovery. Property damage can intensify stress and anxiety levels, highlighting the need for interventions that address both material losses and emotional distress to foster holistic recovery and resilience within the community.



The survey highlights significant mental health challenges following the flood, with 55% reporting increased anxiety and worry. It is essential to grasp the nuanced experiences of distress to tailor interventions that meet specific needs and foster resilience among those affected. Factors like livelihood loss, displacement, and uncertainty about the future contribute to heightened anxiety levels, underscoring the necessity for comprehensive mental health interventions. These interventions should address underlying stressors and enhance coping skills within the community.



The frequency distribution reveals diverse levels of concern about the future impacts of climate change on mental health. A significant majority (70%) express high levels of concern, with 55 individuals describing their concern as "extreme." This indicates a widespread awareness of the potential psychological effects of climate change in Badin, Pakistan. Addressing these concerns necessitates comprehensive strategies encompassing mental health education, accessible support services, and community resilience-building initiatives aimed at mitigating anxiety and distress.



The data shows that a notable number of individuals (55) sought mental health support after the flood, indicating awareness or recognition of the need for assistance. However, a larger group (110) did not seek support, possibly due to barriers like stigma, limited access, or reliance on alternative coping methods. Overcoming these barriers is essential for fostering mental health resilience in flood-affected communities, underscoring the need for accessible and culturally appropriate support services.

The focus group discussions highlighted significant psychological distress among participants post-flood, including feelings of despair, anxiety, and PTSD symptoms like intrusive thoughts and sleep disturbances. This underscored the urgent need for tailored mental health interventions in flood-affected communities. Participants stressed the critical role of social support networks—family, friends, and community solidarity—in providing both emotional comfort and practical assistance during crises, emphasizing the importance of mutual aid and collective problem-solving in fostering community resilience.

Environmental concerns were also prominent, with worries about recurrent flooding, environmental degradation, and their impacts on agriculture and livelihoods. Participants identified sustainable policies and community-based adaptation strategies, such as flood-resistant infrastructure and climate-smart agricultural practices, as essential for mitigating long-term climate change impacts. Access to mental health services remained a significant challenge due to financial, stigma-related, and geographical barriers. Participants advocated for accessible and culturally sensitive support services, including community outreach and telemedicine initiatives, to bridge gaps in mental health care. They discussed coping mechanisms like religious practices and communal gatherings, underscoring the need for holistic, community-driven resilience-building approaches that integrate mental health support into broader disaster and climate adaptation strategies.

POLICY RECOMMENDATIONS

1. **Strengthening mental health service:** By integrating mental health into climate adaptation policies and implementing community-based interventions to promote well-being and adaptive coping strategies, this research aims to deepen understanding of the complex interplay between climate change and mental health. By addressing these dynamics, the study seeks to inform evidence-based interventions that build resilience and foster sustainable development in climate-affected regions, thereby enhancing the capacity of vulnerable communities to cope with environmental challenges.

2. **Research and Monitoring:** Enhance support for ongoing research initiatives and establish robust monitoring systems to track shifts in mental health indicators, climate-related risks, and community resilience. These efforts will enable evidence-based decision-making and facilitate targeted interventions aimed at enhancing adaptive capacities in vulnerable communities over time.

3. **Community-Based Interventions:** Implement comprehensive community-based mental health programs designed to cultivate strong social support networks, resilience-building activities, and awareness campaigns. These initiatives aim to enhance mental well-being and equip individuals with effective coping strategies in the face of challenges posed by climate change and other stressors.

4. **Capacity Building:** Prioritize investments in capacity-building initiatives aimed at healthcare professionals, community leaders, and disaster responders. These efforts aim to deepen their understanding of mental health issues and strengthen their ability to effectively address psychosocial needs during and after climate-related disasters.

5. **Education and Awareness:** Establish educational programs and public awareness campaigns aimed at reducing stigma associated with mental health, enhancing understanding of how climate change impacts mental well-being, and promoting adaptive coping mechanisms. These initiatives are crucial for fostering a supportive environment that encourages resilience and well-being in communities facing climate-related challenges.

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PAPER 3: STRENGTHENING WOMEN IN SEXUAL REPRODUCTIVE HEALTH RIGHTS (SRHR) THROUGH GENDER- RESPONSIVE CLIMATE ADAPTATION STRATEGIES IN GILGIT BALTISTAN, PAKISTAN

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OVERVIEW

This research examines the intersection of gender dynamics, sexual reproductive health rights (SRHR), and climate change adaptation in Gilgit Baltistan, Pakistan, focusing on enhancing women's empowerment. Using a mixed-methods approach, the study utilizes focused group discussions (FGDs) to blend qualitative insights with quantitative demographic and climate change awareness data from 80 participants. The findings highlight significant challenges women face in accessing healthcare services amidst climate change impacts, including limited awareness about climate issues, marital status, education, and occupation influencing their experiences. The qualitative analysis underscores barriers such as restricted healthcare access, forced displacement, and mental health stressors exacerbated by climate change.

The study underscores the interconnectedness of climate change knowledge, SRHR awareness, and mental health status. It recommends gender-responsive climate adaptation strategies to strengthen healthcare systems, enhance education and awareness, and prioritize women's SRHR in Gilgit Baltistan. These measures aim to empower women to assert control over their health and advocate effectively for their rights.

In recent years, there has been increasing acknowledgment of the interconnectedness between climate change and women's sexual and reproductive health rights (SRHR). This greatly impacts women who often bear the brunt of its consequences due to their roles as primary caregivers, resource managers, and community leaders (Dhoka, 2022). Despite this, their unique needs and vulnerabilities are often disregarded in climate adaptation strategies and policies.

While sociocultural impediments significantly hinder women from accessing SRHR services, particularly in conservative societies and mountainous regions (Ahmed et al., 2018; Ali et al., 2021; Hussain, A., 2019; Khan, S. et al., 2020), their impact on women's health and livelihoods remains disproportionately severe

Despite existing policies and resources, there remains a significant gap in implementing sexual and reproductive health rights (SRHR) policies in Skardu. This gap is worsened by insufficient prioritization from local governing bodies, resulting in communication breakdowns. To tackle these challenges effectively, it is imperative for authorities to enforce current policies, prioritize SRHR initiatives, allocate funds efficiently, and ensure their effective utilization.

METHODOLOGY

The study used a mixed-methods approach, probability sampling technique, stratified random sampling is employed to ensure representation from diverse demographics, encompassing age, and socioeconomic status. This strategy enhances the generalizability of findings while minimizing selection bias

Four focus group discussions were conducted across various villages in Skardu, with each group comprising approximately 11-16 participants. In-depth discussions were specifically tailored for 44 female stakeholders from developmental sectors, healthcare professionals, and private stakeholders. These focused discussions allowed for a nuanced exploration of diverse viewpoints and experiences concerning climate change and women's sexual and reproductive health and rights.

Qualitative data from the focus group discussions and observations underwent thematic analysis to uncover patterns, themes, and key insights. On the other hand, quantitative data analysis utilized the Statistical Package for the Social Sciences (SPSS) for conducting regression, correlation analysis, and other relevant statistical tests to explore relationships between study variables.

RESULTS AND DISCUSSIONS

Pearson Correlation Coefficients among Key Study Variables

Variable	Climate Change	Sexual Reproductive Health Rights	Access to SRHR Services Post-Disaster	Mental Health
Climate Change	1	-	-	-
Sexual Reproductive Health Rights	0.45*	1	-	-
Access to SRHR Services Post-Disaster	-0.30*	0.55*	1	-
Mental Health	0.25*	0.20*	-0.40*	1

The Pearson correlation coefficients, indicated meaningful connections between the knowledge about climate change and SRHR awareness ($p < .05$), indicating that individuals who have a better understanding of climate change are more likely to be aware of their sexual and reproductive health rights.

Conversely, a negative correlation of -.30 was found between access to SRHR services post-disaster and knowledge about climate change ($p < .05$). This suggests that increased awareness of climate change does not necessarily improve access to SRHR services following disasters, possibly due to systemic barriers or resource constraints. Moreover, the significant negative correlation of -.40 between access to SRHR services and mental health status ($p < .05$) underscores the profound impact of limited access to these services on individuals' mental well-being. These findings underscore the critical need for robust support systems in disaster-affected areas.

Regression Analysis

Variable	B (Coefficient)	Std. Error	β (Standardized Coefficient)	t	p-value
Constant	2.05	0.45	-	4.56	< .001
Climate Change	0.25	0.08	0.30	3.12	.002
Sexual Reproductive Health Rights	0.15	0.07	0.20	2.14	.034
Access to SRHR Services Post-Disaster	-0.40	0.09	-0.45	-4.44	< .001

The regression analysis examines how mental health status relates to three predictors: knowledge about climate change, SRHR awareness, and access to SRHR services post-disaster. The results reveal a significant positive effect of climate change awareness on mental well-being (B = 0.25, p = .002), suggesting that individuals with greater understanding of climate change tend to have better mental health. This association may reflect a sense of empowerment derived from knowledge, potentially mitigating the psychological impacts of climate change. Similarly, awareness of sexual and reproductive health rights shows a positive impact on mental health status (B = 0.15, p = .034), indicating that awareness can enhance well-being by empowering individuals and facilitating access to healthcare.

Conversely, the availability of SRHR services post-disaster demonstrates a significant negative impact on mental health status (B = -0.40, p < .001). This underscores the critical role of these services in maintaining mental well-being following disasters. The negative coefficient suggests that limited access to SRHR services significantly worsens mental health outcomes, underscoring the urgent need to prioritize and ensure robust availability of SRHR services in disaster recovery efforts. These findings highlight the intricate interplay between awareness, access to services, and mental health outcomes in vulnerable populations affected by disasters.

Thematic analysis of Focus Group Discussion revealed that Cultural taboos and misinformation significantly hinder menstrual health, resulting in limited access to hygiene products and inadequate support for menstruating individuals. Misconceptions about contraceptive use, compounded by limited access to contraceptives, contribute to reproductive health disparities and increase unintended pregnancies.

Deep-seated cultural and religious beliefs further fuel misunderstandings about contraception, leading to low utilization rates and higher incidences of unintended pregnancies. Addressing these challenges requires effective strategies such as culturally sensitive education and collaboration with community leaders to dispel myths and promote accurate information about contraception and reproductive health.

Additionally, insufficient funding for healthcare systems impedes the recruitment and retention of qualified professionals, affecting the quality and accessibility of reproductive healthcare services overall.

Extreme weather events and infrastructure challenges significantly disrupt healthcare delivery and access to medical services, especially in remote and marginalized communities. These disruptions exacerbate existing health disparities and hinder timely access to critical healthcare interventions.

Limited education and awareness about puberty among adolescents contribute to reproductive health disparities, emphasizing the urgent need for comprehensive sexuality education programs. These initiatives can empower adolescents with accurate information and skills to make informed decisions about their reproductive health, potentially reducing unintended pregnancies and improving overall health outcomes.

Moreover, limited access to contraception and widespread misconceptions about its use further exacerbate reproductive health disparities.

POLICY RECOMMENDATIONS

1. **Community-Centered Networks for Support:** Creating networks of assistance centered around communities in Skardu is essential for addressing the multifaceted needs of women. These networks should prioritize mental health resources tailored to the unique challenges faced by women, resilience strategies to navigate climate-related difficulties, and comprehensive education on reproductive health. By fostering community support systems, women can access vital resources and support networks that enhance their overall well-being and empower them to face health challenges effectively.

2. **Integrating Environmental Education in Medical Centers:** Medical centers in Skardu should integrate environmental education into their services to better prepare women for climate change impacts. This includes providing guidance on adapting to environmental changes, reducing carbon footprints, and understanding how climate change affects reproductive and mental health. By equipping women with knowledge and skills to mitigate environmental risks, medical centers can contribute to their resilience and empower informed decision-making about health in the face of climate challenges.

3. **Gender-Responsive Disaster Preparedness:** Stakeholders and policymakers must prioritize gender-responsive disaster preparedness efforts in Skardu. This involves developing contingency plans that specifically address the needs of women during disasters, such as ensuring access to reproductive healthcare services, providing safe birthing facilities during emergencies, and securing resources for managing menstrual hygiene. By incorporating gender considerations into disaster planning, communities can effectively protect and support women's health and well-being in times of crisis.

4. **Promoting Cross-Sectoral Collaboration:** Encouraging cross-sectoral cooperation is crucial for successful execution. It will be possible to create comprehensive solutions that incorporate SRHR, climate resilience, and mental health by bringing together healthcare specialists, environmental experts, community leaders, and mental health professionals.

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