EXPLORING THE DYNAMICS OF SILENCE AND VULNERABILITY IN GILGIT-BALTISTAN, COMPREHENSIVE ANALYSIS OF SOCIO-POLITICAL, ECONOMIC, AND ENVIRONMENTAL CHALLENGES IN A MARGINALIZED REGION

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APPROVAL OF EXAMINATION

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DEDICATION

In profound gratitude, I dedicate this thesis to my beloved family, whose unwavering support has been my greatest strength. To my esteemed teachers, your guidance has shaped my academic journey. A special tribute to my elder brother, Saif Ur Rehman, for his unwavering encouragement and belief in my potential.

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ABSTRACT

This study examined the relationship between silence and vulnerability in the remote mountain communities of Pakora and Koshineat, Tehsil Shounter, District Astore, Gilgit-Baltistan, with particular emphasis on socio-political, economic, and environmental dimensions and the development of a science-based manifesto for resilience. A mixed-methods design was employed, combining a household survey of 80 respondents with semi-structured interviews, field observation, GIS-based spatial assessment, and stakeholder consultation. The findings demonstrated that vulnerability was multidimensional and closely linked with limited information access, weak institutional engagement, climate-sensitive livelihoods, and recurrent environmental hazards. Overall, 82.5% of respondents reported limited or no access to climate information, 77.5% had no institutional contact during the previous 12 months, and 53.8% lacked access to an early warning system. Agriculture and livestock were the main livelihood source for 56.2% of respondents, while the average estimated livelihood loss was 34.9%. Environmental exposure was also substantial, with 76.2% reporting a severe hazard experience during the previous five years and 78.8% observing environmental degradation. Floods and flash floods were perceived as the most serious threat, with a mean risk score of 4.05 out of 5, while GIS assessment identified spatial concentrations of high and very high risk along stream banks, steep slopes, settlement margins, and vulnerable access routes. The study concluded that silence and vulnerability were mutually reinforcing, as weak community representation, limited information access, and poor institutional contact reduced local capacity to influence preparedness and response. Based on the integrated findings, a science-based manifesto was developed around community voice, climate information, early warning and preparedness, environmental management, livelihood resilience, institutional coordination, and evidence-based planning to strengthen resilience in remote mountain communities of Gilgit-Baltistan.

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Chapter 1

INTRODUCTION

1.1 Background of the Study

Mountain areas were well known as being one of the most vulnerable to climate change due to the fact that change in the environment, fragile ecosystems, and low levels of service access tended to interact and raise the risk at the local level (Adler et al., 2022). In most mountainous environments, the effects of climate were not solely environmental phenomena, but also social and economic stressors on livelihood, mobility, health, and decision-making locally (Dhimal et al., 2021; Scotti et al., 2023).

One of the most vulnerable and risky areas of Pakistan in terms of the environment was Gilgit-Baltistan. The strategy of regional climate reported that climate change was now one of the greatest barriers to the economic development of Gilgit-Baltistan, and frequent disasters had led to severe losses in the infrastructure, livelihoods, and ecosystems (Government of Gilgit-Baltistan, 2023a). Regional adaptation action plan also mentioned that rapid changes in climate had brought the need to safeguard human and ecological health and resilient communities in risky sectors (Government of Gilgit-Baltistan, 2023b).

The settlements of high mountain areas generally relied on land, water, forest, and animals to survive on a daily basis. According to the recent research conducted in Gilgit-Baltistan, it was found that these livelihood systems had turned out to be more susceptible due to the direct impact of the changing temperature, fluctuations in rainfall, seasonal changes, and exposure to hazards on agriculture, water availability, and household stability (Ali et al., 2024; Tuladhar et al., 2023). The situation in the Upper Indus Basin meant that people in the area noticed shifts in precipitation, temperatures, crop yield, and water supply, which indicated that climate stress had already affected the daily life of communities living in the mountains (Tseluladhar et al., 2023).

Landslides, glacial lake outburst floods and floods had become a major danger in the mountainous belt of the north of Pakistan. According to research conducted in Gilgit-Baltistan, people had become more risk-aware in relation to climate-related hazards,

whereas remote settlements were not adequately prepared as their terrain was challenging, and institutions did not reach them (Aslam et al., 2022; Shah and Rana, 2023). Wider mountain studies also revealed that the mountainous flood risk had become more complicated since climate change and human pressures were co-occurring on delicate landscapes (Rijal et al., 2024).

Also accompanied by the environmental risk, Gilgit-Baltistan had been subjected to some form of political and structural marginalization. A study of horizontal inequalities in Gilgit-Baltistan revealed that the inequalities relating to access, exclusion, and identity had influenced social tensions and developmental outcomes in the country (Abbas et al., 2023). In this respect, exposure to hazards was not the only vulnerability. It was also associated with the possession of voice, access to resources and ability to shape policy and development priorities (Scotti et al., 2023; Fatima et al., 2025).

The current research was informed by the fact that silence and vulnerability were very much related concepts in distant mountain societies. Silence in this thesis did not necessarily mean the lack of the word. It mentioned poor representation in policy making, inadequate access to climate knowledge, poor visibility in formal research work, and ignoring local knowledge in formal planning. It had particularly been pointed in the proposal of this research that people of District Astore, Tehsil Shounter and in particular the communities of Pakora and Koshineat were experiencing flash floods, landslides, environmental degradation, and lack of access to scientific resources and policy support.

This research had thus been intended to get past a limited hazard-based concept of risk. It had also sought to analyses the combined effect of socio-political marginalization, economic straining, environmental deterioration, and poor communication about climate on the experiential vulnerability of the local communities. The proposal had also clarified that the research was aimed at coming up with a science-based manifesto that could bridge science evidence and community knowledge and policy orientation towards building resilience in the study area.

The novelty of this study lies in its integrated examination of silence and multidimensional vulnerability within the remote mountain communities of Pakora and Koshineat, District

Astore. Rather than examining environmental hazards, livelihood insecurity, institutional weakness, or community exclusion separately, the study brings socio-political, economic, environmental, and spatial dimensions together within a single analytical framework. It further strengthens this approach by combining community perceptions with household-level evidence, stakeholder perspectives, field observations, and GIS-based risk assessment. Most importantly, the study moves beyond vulnerability assessment by translating the combined evidence into a science-based manifesto that connects local knowledge, scientific evidence, community voice, and practical resilience actions. This place-specific and action-oriented integration represents the principal contribution of the study to research on vulnerable mountain communities in Gilgit-Baltistan.

1.2 Problem Statement

Remote mountain communities in District Astore face recurrent floods, landslides, water stress, environmental degradation, and livelihood insecurity. In Pakora and Koshineat, these risks are intensified by dependence on climate-sensitive livelihoods, weak institutional support, and limited access to services, making vulnerability a combined environmental, economic, and socio-political problem.

Existing research in Gilgit-Baltistan has largely examined climate hazards, livelihoods, governance, and adaptation separately, with limited attention to how these factors interact in remote communities of Tehsil Shounter. A critical gap is the role of silence, reflected in weak representation, limited climate information, poor institutional contact, and inadequate inclusion of local knowledge in planning and decision-making.

The core problem, therefore, was the absence of an integrated, place-specific framework explaining how silence and multidimensional vulnerability reinforce each other in Pakora and Koshineat. This study addressed that gap by combining community, institutional, and spatial evidence to develop a science-based manifesto for locally relevant resilience and preparedness.

1.3 Research Objectives

1. To identify the major socio-political, economic, and environmental factors that had shaped vulnerability among the communities of Tehsil Shounter, particularly in Pakora and Koshineat.
2. To explore local perceptions of risk, access to climate-related information, and the extent to which community voices had been included or excluded in climate and development discussions.
3. To develop a science-based manifesto by integrating scientific evidence, field-based findings, and community perspectives for improving resilience, preparedness, and sustainable development in the selected communities of Astore District, Gilgit-Baltistan, Pakistan.

1.4 Research Questions

1. What major forms of socio-political, economic, and environmental vulnerability had affected the communities of Pakora and Koshineat in Tehsil Shounter, District Astore?
2. How had local people perceived climate change, hazards, and their own exposure to risk?
3. To what extent had these communities accessed scientific knowledge, climate information, and institutional support?
4. In what ways had silence appeared in the lives of these communities, particularly in relation to representation, communication, and policy response?
5. How could scientific evidence and local knowledge be combined into a practical manifesto for reducing vulnerability and strengthening resilience?

These questions were consistent with the proposal's research direction, methodology, and expected outcomes.

1.5 Significance of the Study

This study had been significant on both academic, practice and policy levels. Scholarly, it had answered a very evident void of not only integrating the themes of silence, vulnerability, climate risk, and mountain marginalization under a single integrated

framework. The proposal had already known that previous work used to address these issues independently, which restricted the knowledge about their joint impacts in Gilgit-Baltistan.

The study was also important at the community level since it targeted remote settlements whose experiences were frequently not well represented in formal research. Recent Gilgit-Baltistan research revealed direct effects of environmental change on remote mountain community livelihood, water insecurity, and environmental change (Ali et al., 2024; Tuladhar et al., 2023). Through the recording of local viewpoints and local knowledge, the research was meant to bring about more community realities into planning and research. Mountain vulnerability literature also aided this approach, highlighting the importance of rural agency and situated knowledge in climate adaptation (Scotti et al., 2023).

The study was relevant at the policy level since official climate policy documents on Gilgit-Baltistan had already recommended increased adaptation planning, institutional capacity, promotion of research and dissemination of knowledge (Government of Gilgit-Baltistan, 2023b). The research was capable of contributing to these policy objectives by yielding evidence that was locally based as well as directly associated with vulnerable populations. The suggested manifesto was thus set to turn out as a workable interpolative among science, policy and community action.

The study was also important in the sense that the researchers have not only looked at resilience as physical safeguard against hazards, but also enhanced active involvement, better access to information and better community voice. Climate action research in Gilgit-Baltistan had revealed that policy analysis, education and community involvement were important in effective climate action, and not necessarily on technical solutions alone (Fatima et al., 2025). That is why the research was scholarly and practical.

1.6 Scope of the Study

This thesis had been limited to the study of silence and vulnerability in selected communities of District Astore, Tehsil Shounter, especially Pakora and Koshineat, as stated in the proposal. This research had been based on socio-political, economic and

environmental aspects of vulnerability with special reference given to climate-related risks including floods, landslides and other associated risks.

The research had reviewed the local perceptions, access to scientific information, exposure to disaster, and the experience of the community using a mixed methodology that involved surveys, interviews, field tour, GIS analysis, and consultation of stakeholders. It had not sought to arrive at a province-wide statistical generalization of the entire Gilgit-Baltistan. Rather, it had sought to create a profound context specific knowledge about the chosen area and deploy such knowledge to create a science-based manifesto with broader policy implications.

The paper had also been kept within the framework of vulnerability and resilience considering community and environmental science. It was not actually intended to be a political study per se, though there were issues of governance, exclusion and representation which had been taken up where they directly affected vulnerability. Similarly, the work had not tried to construct all the climate scenarios in the long term in the region. It had been concerned with current lived lives, local threats, and practicable ways of resilience in the selected communities.

Chapter 2

LITERATURE REVIEW

2.1 Concept of Vulnerability

The concept of vulnerability had been extensively applied in climatic change, disaster studies, development study, and environmental study. Vulnerability was not a condition that was discussed as a single one in the recent literature. It was interpreted as a set of risk exposure, vulnerability to damage, and small ability to react, cope, or recuperate (Adler et al., 2022). In the mountain areas, vulnerability had been perceived in a more compound manner since ecological fragility, physical isolation, poor infrastructure and low-level services acted in unison and augmented risk to the local communities (Scotti et al., 2023; Muccione et al., 2024).

Recent mountain literature demonstrated that it was not only the environmental hazards that made people vulnerable. Also, it was influenced by inequalities in land, resources, institutions, information, and decision-making platforms (Scotti et al., 2023). This implied that two communities confronted with the same hazard may not be equally vulnerable due to the possibility of variation in their social position, economic power and institutional support. In this respect, vulnerability was already perceived as a multidimensional phenomenon as opposed to a physical or environmental one (Adler et al., 2022; Fatima et al., 2025).

In the case of this thesis, vulnerability was conceptualized as the state whereby the communities in the study area were vulnerable to environmental hazards in addition to experiencing social, political, and economic impairments that lessened their preparedness, adaptation, and recovery capacity. This interpretation was consistent with the proposal, which did not consider two themes: silence and vulnerability as distinct.

2.2 Silence and Marginalization in Mountain Communities

The silence in the mountain communities had not necessarily implied the lack of speech. Silence in the recent literature might be interpreted as invisibility, poor representation,

restricted engagement in the policy-making process, and non-membership in formal knowledge systems. According to literature on the vulnerability of the mountains, local communities were commonly regarded as passive communities, but not as holders of knowledge and participants in decision-making (Scotti et al., 2023). This type of silence was more acute in the distant regions where the absence of geographic access and poor institutional reach meant that people were less vocal and policy-focused.

Recent research indicated that climate policy and education was still underdeveloped in Gilgit-Baltistan and the area was disproportionately underrepresented in research and policy discussions, despite it being at significant risk of climate change (Fatima et al., 2025). Such underrepresentation was critical since local realities might remain concealed when the research, planning and the communication of such realities to the general population did not properly incorporate the remote settlements. The proposal of this research project had also highlighted that there was a lack of access to scientific resources among communities in the District of Astore, Tehsil Shounter, particularly, Pakora and Koshineat had not got enough attention in official discourse of vulnerability.

Marginalization of mountain areas had usually assumed pragmatic forms. These were inaccessibility to the services, poor connectivity, ineffective integration in the market, low institutional base and inadequate participation in key developmental decisions. A study on Gilgit-Baltistan revealed that the experiences of insecurity and development in the region had been affected by the inequalities and exclusion in the area (Abbas et al., 2023). Silence in these contexts might be viewed as a structural reality where societies were present in physical form but silent as an institution. This knowledge was quite applicable to the current research as the suggested manifesto was aimed to make local silence become evidence-based visibility.

2.3 Socio-Political Vulnerability

Socio-political vulnerability was the aspects in which the relations of power, exclusion, weak institutions, and unequal involvement augmented the vulnerability of communities to hurt. However, as recent reports had demonstrated, the effects of climate and disasters were more intense in cases where governance was weak, the coordination was bad and the voices

of the locals were not taken into account in planning (Fatima et al., 2025; Shah and Rana, 2023). In mountainous areas, the problems were more severe since the administrative mechanisms could not always reach the isolated people.

The climate strategy and the adaptation action plan both in Gilgit-Baltistan revealed that the institutional coordination, policy integration, and knowledge dissemination needed to be stronger to enable effective climate adaptation (Government of Gilgit-Baltistan, 2023a, 2023b). This was revealed to indicate that vulnerability in the area was not exclusive to the natural hazards. It was also attributed to the implementation of policies, coordination of institutions as well as delivery of information to local communities. Where policy was still a piece of paper, and never arrived at practice, there still was vulnerability.

It was also reported in the literature that development experiences in Gilgit-Baltistan had been influenced by the inequality and identity-based exclusion. Abbas et al. (2023) demonstrated that horizontal inequalities had affected tensions in the society and wider state of affairs in the area. Even though the current thesis was not a conflict study, this literature was significant in the sense that it demonstrated the vulnerability of Gilgit-Baltistan had a political and structural aspect. Thus, the socio-political vulnerability in this thesis was perceived as the cumulative impact of the poor representation, unequal response of the institution and poor participation in policy and development processes.

2.4 Economic Vulnerability

Economic vulnerability had been defined as the state where households or communities had no secure and diverse livelihoods so that they were more vulnerable to shocks and less likely to bounce back than the loss. This type of vulnerability had been more robust in the mountain regions since the local economies were largely reliant on climate-dependent activities including farming, animals, forest utilization, and seasonal work (Ali et al., 2024; Tuladhar et al., 2023). When there was a shift in weather patterns or the crops were ruined by hazards, this directly influenced the household income and food security.

The recent studies in the high mountain areas of Pakistan revealed that the climate change had undermined the dependability of agriculture and that it had strained the small

landowners and pastoralists. In Nagar Valley and those high-altitude pastoral regions, it was discovered that the local residents experienced stresses in livelihoods, the cost of adaptation, and the disproportionate adaptive capacity to extreme weather conditions (Ali et al., 2025a; Ullah and Bavorova, 2025). These researches revealed that economic vulnerability was not limited to poverty in general sense. It also concerned the inability to absorb climatic shocks, invest in adaptation and stable livelihoods over the long term.

The climate strategy of the region integrating Gilgit-Baltistan also acknowledged that climate change had turned out to be an obstacle to economic progress and the frequent losses of disasters were eating up development funds (Government of Gilgit-Baltistan, 2023a). This was very pertinent to the current study since more distant communities like the ones in Tehsil Shounter had few livelihood options and less institutional support than more linked ones. The vulnerability to the economy was thus an ongoing theme of the current literature review and the overall sense of silence and vulnerability in the study.

2.5 Environmental Vulnerability and Climate Risks

One of the most visible areas of risk in mountain communities had been environmental vulnerability. The literature on climate change has always indicated that mountainous areas were quite vulnerable to warming, shifting snowfall and rainfall, glacier melting, hydrological disequilibrium, and other threats (Adler et al., 2022; Dhimal et al., 2021). The environment was not the only thing that was altered but also human systems that relied on the environment.

In Gilgit-Baltistan, the official planning documents identified climate change as a significant problem in the region and associated it with the growing frequency of disasters, the destruction of infrastructure, and damage to the ecosystem, as well as the stress on livelihoods (Government of Gilgit-Baltistan, 2023a, 2023b). An empirical study carried out by Gilgit-Baltistan also revealed that water availability, agricultural and livelihood systems were impacted by climate change in the high mountains (Ali et al., 2024; Tuladhar et al., 2023).

Landslides, glacial lake outburst floods, and flash floods as well as erosion had been of great concern in the mountainous belt in the North of Pakistan. A study on Ghizer District revealed that the communities felt the rising GLOF-related risk and were aware of the rising severity of climate-related hazards in Gilgit-Baltistan (Aslam et al., 2022). Extended studies also revealed that the risk of mountain floods was also rising due to the combination of climate change and human activities on sensitive mountain terrain (Rijal et al., 2024).

Recent land surface analyses of Gilgit-Baltistan and urban climate analyses of Gilgit also indicated that environmental change was occurring through land cover change, urban pressure, and landscape change, which were reflected concerning ecological balance and local resilience (Khan et al., 2024; Shah et al., 2025). Thus, environmental vulnerability in this thesis had been interpreted as a dynamic situation where communities were simultaneously at risk of climate change and ecological stress and hazard-prone landscapes.

2.6 Community Knowledge, Adaptation, and Resilience

Recent papers were a growing demonstration of the fact that community knowledge was the core of comprehending the risk of climate and creating responses that are appropriate at the local scale. The concept of adaptation based on technical planning was not thought to be successful according to mountain studies, as local people possessed practical knowledge regarding season change, water behavior, land conditions, and survival strategies (Scotti et al., 2023; Muccione et al., 2024). This literature was significant to the current research due to the fact that the intended manifesto sought to bring together scientific information with the community practice.

Recent researches among high mountain areas in Pakistan revealed that the perception of the locals had a substantial impact on adaptation decisions. A study of farming in Nagar District at high altitude considered that household traits and local knowledge were a significant factor in the manner the farmers perceived climate change and reacted to it (Ali et al., 2025b). One more research in the identical area revealed that the household level factors influenced the development of the adaptation mechanisms, and thus not every family was able to respond to climate change in a similar manner (Ali et al., 2025a). In a similar manner, in a study conducted on pastoral populations in Pakistan, it was

demonstrated that adaptive capacity and climate resilience were imbalanced and relied on the livelihoods of the populations, access to support, and local adaptation to extreme weather (Ullah & Bavorova, 2025).

The broader writing on mountain adaptation also revealed that the more recent climate solutions were focusing on participatory and place-based solutions compared to the generalized models of policy solutions (Muccione et al., 2024). Institutional strengthening and climate-related research were also prioritized in the knowledge dissemination and official climate planning as beneficial components of resilience building in Gilgit-Baltistan (Government of Gilgit-Baltistan, 2023b).

Resilience in this paper had therefore not been considered as simply the capability to overcome a disaster. It was conceived in a broader sense as the capacity of communities to predict risk, apply local and scientific experience, engage in planning and recover in ways through which long-term social and environmental wellbeing would be maintained. This knowledge was very suitable with the objective of establishing a science-based manifesto in the field of study.

2.7 Research Gap

The reviewed literature showed that important work had already been carried out on climate risk, livelihoods, adaptation, and disaster vulnerability in mountain regions and in Gilgit-Baltistan. However, several important gaps still remained.

First, a significant part of the literature had studied the issues of environment, economy and governance individually. Existing literature did not pay much attention to silence and vulnerability as two closely related processes, particularly when it concerned remote mountain communities. As it was already proposed in the present study, previous studies tended to deficient an integrated approach to socio-political, economic and environmental vulnerability in the chosen area.

Second, despite the fact that Gilgit-Baltistan was already considered as highly climate-vulnerable, the literature remained unevenly distributed across the locations. Numerous

empirical investigations had been carried out on the districts of Nagar, Ghizer, Hunza or Gilgit, and very little information was found on the particular communities in District Astore, Tehsil Shounter, particularly, Pakora and Koshineat. This implied that the actualities of these communities had not been so apparent in the scholarly and policy discourse.

Third, although recent work has paid more attention to local perceptions and adaptation, less work had attempted to translate that evidence into a feasible policy and community action framework or manifesto. The current proposal was aimed explicit to fill this gap by creating a science-based manifesto to integrate field evidence, scientific instruments, local views, and policy relevance.

Fourth, there was an increasing interest in the literature on resilience, but resilience was frequently discussed broadly. There were fewer studies that had investigated the role of silence, exclusion and poor access to knowledge in restraining resilience in remote mountain communities despite the well knownness of hazards. The ongoing issues with translating the policy into a local action were also highlighted in the recent climate policy analysis of Gilgit-Baltistan (Fatima et al., 2025).

It is because of these reasons that the current study had been planned to achieve an original contribution. It covered an abandoned place, employed a combined perception of vulnerability and sought to turn the realities at the ground into a manifesto that was governed by science and community insights.

2.8 Conceptual Framework

The conceptual framework of this study had been constructed on the understanding that silence and vulnerability were mutually supportive states in remote mountain communities. Vulnerability had been conceptualized in three main dimensions which were socio-political vulnerability, economic vulnerability, and environmental vulnerability. These three dimensions did not work independently. They related to each other and influenced the state of existence of the communities.

Weak representation, low institutional response, and participation in climate and development processes had been referred to as socio-political vulnerability. The term economic vulnerability had been used to mean weak livelihoods, reliance on resources that are subject to climatic conditions, and low adaptive capacity. Exposure to environmental hazards like floods, landslides, and ecological stress caused by climatic conditions had been referred to as environmental vulnerability. It was demonstrated in the literature that these dimensions tended to interact in the mountainous areas and influence community resilience together (Adler et al., 2022; Ali et al., 2024; Aslam et al., 2022).

The concept of silence had been placed within the context as both a factor of vulnerability and an effect. The less visible in the policy debate and thus less likely to influence the decision-making process, the more the communities were weakly accessed to the scientific knowledge and created silence. Such silence at that time further weakened vulnerability since the local needs and local solutions had lower chances of being identified. Conversely, once communities were so vulnerable they commonly had less resources and less avenue on which to make their voices heard. Through this, silence and vulnerability were in a cycle.

As enabling forces that are likely to disrupt this cycle, community knowledge, scientific tools, and participatory engagement had been put in the framework. Evidence-based planning, local knowledge, climate education, and participatory adaptation were identified as possible mechanisms that would enhance the resilience of communities in the mountains (Muccione et al., 2024; Fatima et al., 2025; Ali et al., 2025b). Hence the end product of the framework was a science-driven manifesto which incorporated a unification of local voice, scientific facts, GIS-based insight, and practical policy direction on the study region.

Chapter 3

METHODOLOGY

3.1 Research Design

This study employed a mixed-methods research design, combining quantitative and qualitative approaches. The quantitative component assessed patterns of vulnerability, while the qualitative component explored community experiences, perceptions, and local perspectives. The study also incorporated descriptive, exploratory, and participatory elements to support the development of a science-based manifesto.

3.2 Study Area

The study was conducted in Tehsil Shounter, District Astore, Gilgit-Baltistan, specifically in the villages of Pakora and Koshineat. The population of Pakora is 1700 and the Koshineat population is almost 1000. These remote mountain communities were selected because of their exposure to environmental hazards, geographic isolation, climate-sensitive livelihoods, and associated socio-economic vulnerability. The total respondents is 80, in pakora the,42 respondandts were selected, including 25males and 17 females. In koshineat, 38 resondants were selected, comprising 17 males and 21 females, indicating relatively balance gender representation across the two villages

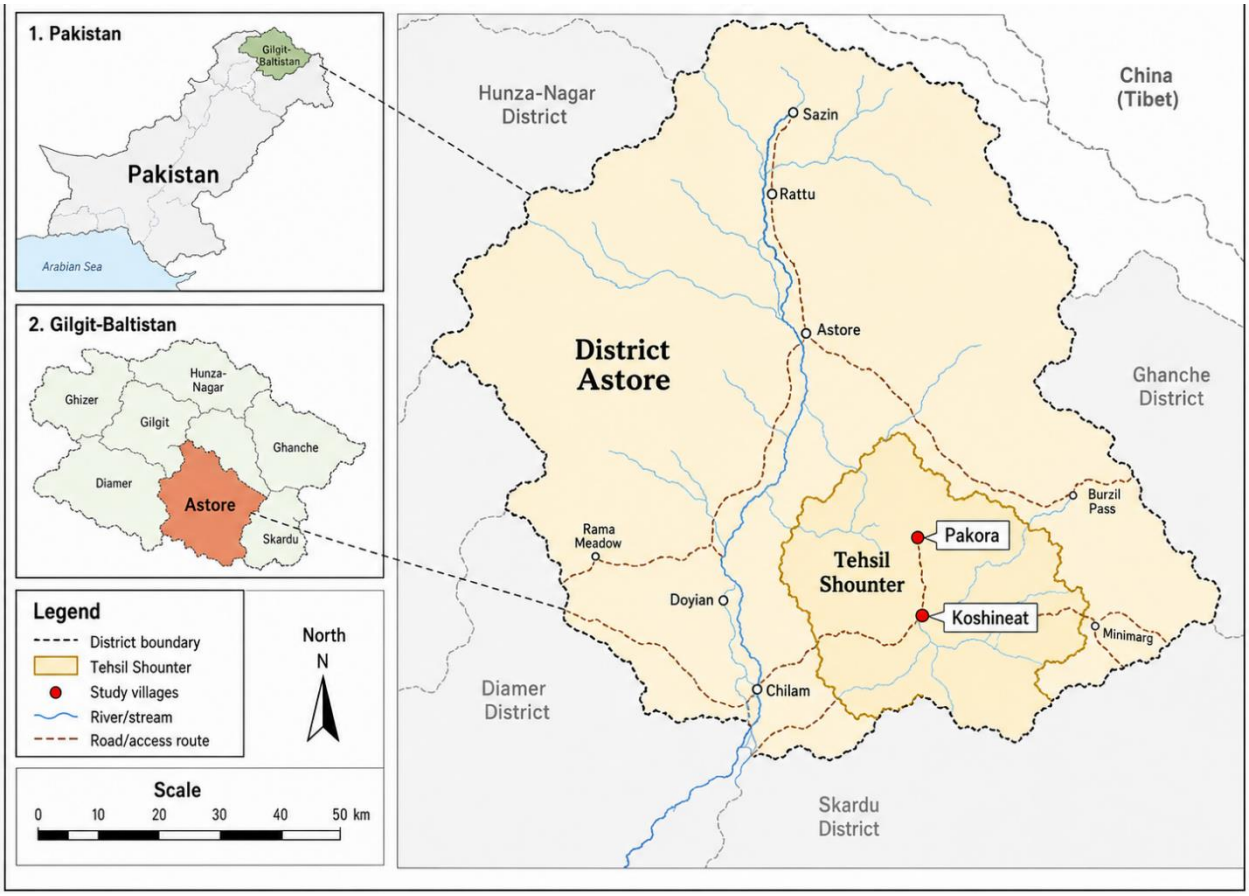


Figure 1. *Study area map of District Astore, Gilgit-Baltistan, showing the selected study villages Pakora and Koshineat in Tehsil Shounter.*

3.3 Study Population

The study population comprised adult residents of Pakora and Koshineat, including individuals affected by environmental hazards, community elders and local leaders, government officials, NGO representatives, and subject experts related to climate, environment, and resilience planning. These groups represented both community-level and institutional perspectives relevant to the study.

3.4 Sampling Strategy

Purposive sampling was used for the study. For the quantitative component, 80 respondents were selected from Pakora (n = 42) and Koshineat (n = 38). For the qualitative component,

relevant key informants were selected purposively, with snowball sampling used where necessary to identify additional participants. Qualitative data collection continued until sufficient information was obtained.

3.5 Data Collection Methods

Data were collected using multiple methods, including survey, semi-structured interviews, field observation, GIS-based spatial assessment, and stakeholder consultation.

3.5.1 Literature Review

A detailed review of scientific literature, policy documents, government reports, and related studies was carried out. This review helped in understanding the theoretical background, identifying the research gap, and supporting the interpretation of field findings.

3.5.2 Survey

A structured survey was conducted among selected community members. The survey was used to collect information on:

- Perceived environmental risks
- Exposure to floods, landslides, and related hazards
- Livelihood dependence on natural resources
- Access to climate-related information
- Awareness of scientific resources and preparedness
- Perceptions regarding community vulnerability

3.5.3 Semi-Structured Interviews

Semi-structured interviews were conducted with selected respondents and stakeholders. These interviews helped in collecting detailed information on:

- Local experiences of vulnerability

- Perceptions of climate change and environmental risks
- Community silence and marginalization
- Institutional support and policy response
- Local adaptation practices
- Suggestions for resilience and future planning

3.5.4 Field Observation

Field observation was conducted during visits to the study area. This method helped in understanding the physical setting, environmental conditions, visible hazard exposure, settlement pattern, and local infrastructure.

3.5.5 GIS and Spatial Assessment

GIS-based assessment was used to support the spatial analysis of vulnerability. This component helped in identifying hazard-prone locations and in understanding the environmental context of the selected communities. It also strengthened the scientific basis of the final manifesto.

3.5.6 Stakeholder Consultation

Consultation with relevant stakeholders was carried out to validate findings and gather practical input for the manifesto. This process helped in linking community evidence with scientific and institutional perspectives.

3.6 Data Collection Tools

The following tools were used for data collection:

- Structured questionnaire for survey respondents
- Semi-structured interview guide for key informants
- Observation checklist for field visits
- GIS maps, location-based notes, and spatial records
- Stakeholder consultation guide

Each tool was designed in accordance with the objectives of the study. The tools were prepared in clear and simple language so that respondents could understand the questions easily. Before final use, the tools were reviewed carefully to improve clarity, relevance, and consistency.

3.7 Data Analysis

Quantitative data were analyzed using descriptive statistics, including frequencies, percentages, and mean scores**,** and presented in tables. Qualitative data from interviews and field notes were analyzed through thematic analysis by coding responses and grouping them into major themes. Spatial data were analyzed using GIS-based assessment to identify hazard-prone and environmentally sensitive locations. Findings from all components were integrated to develop the science-based manifesto.

3.8 Ethical Considerations

Participants were informed about the purpose of the study, and voluntary informed consent was obtained before data collection. Confidentiality and privacy were maintained, and participants were informed of their right to refuse participation or withdraw at any stage. The study was conducted with respect for local culture, community values, and participant dignity.

Chapter 4

RESULTS AND DISCUSSION

4.1 Socio-Political Vulnerabilities

The findings revealed that the socio-political vulnerability was a major problem in the study area. The communities were characterized by low institutional access, poor access to climate-related information, and minimal involvement in local planning and response. These results indicated that environmental exposure alone could not make the community vulnerable, but rather poor communication systems and low community inclusion.

The profile of the respondents revealed that the study has balanced the profile of the two villages equally. Pakora provided 42 respondents and Koshineat provided 38 respondents. There was also a balanced representation of males and females; there were 42 male respondents and 38 female respondents. The educational profile revealed that 28.8% of the respondents had no formal education, 35.0% had a primary education, 20.0% had a secondary education and 16.2% had an education beyond secondary level. The primary livelihood pattern revealed that 56.2% of the respondents were dependent on agriculture and livestock and the remaining respondents were involved in wage labor, seasonal migration, small business, and public or private service.

Table 1. Respondent Profile

Category	Group	Frequency	Percentage%
Village	Pakora	42	52.5
Village	Koshineat	38	47.5
Gender	Male	42	52.5
Gender	Female	38	47.5
Education	No formal education	23	28.8
Education	Primary	28	35.0
Education	Secondary	16	20.0
Education	Above secondary	13	16.2
Main livelihood	Agriculture and livestock	45	56.2
Main livelihood	Wage labor	18	22.5
Main livelihood	Seasonal migration	7	8.8
Main livelihood	Small business	5	6.2
Main livelihood	Public/private service	5	6.2

The socio-political indicators also revealed that a very big majority of the respondents lacked sufficient access to information and institutional support. Among these respondents, 66 out of 80 said that they either had small or no access to climate information. On the same note, 62 respondents indicated that they were not in contact with institutions over the past twelve months. In addition, more than half the respondents said that they had no access to any early warning mechanism. The average score on participation was 2.31/out of 5 and the mean score on voice representation was 2.19/out of 5. These scores were low and indicated that the community members did not feel highly engaged in the process of local decision-making and response.

Table 2. Socio-Political Vulnerability Indicators

Indicator	Frequency	Value
Respondents reporting limited or no access to climate information	66	82.5%
Respondents reporting no contact with institutions in the last 12 months	62	77.5%
Respondents without early warning access	43	53.8%
Mean participation score (1-5)		2.31
Mean voice representation score (1-5)		2.19

A village-by-village analysis revealed that socio-political vulnerability was greater in Koshineat compared to Pakora. The percentage of respondents who had no institutional contact was significantly greater in Koshineat compared with Pakora. The average score of participation and voice representation score was also poorer in Koshineat. These results indicated that even though the both villages were susceptible, the level of exclusion and poor institutional affiliation seemed worse in Koshineat.

Table 3. Village-Level Comparison of Key Vulnerability Indicators

Indicator	Pakora	Koshineat
Severe hazard experience (%)	73.8	78.9
Limited/no climate information (%)	83.3	81.6
No institutional contact (%)	66.7	89.5
No early warning access (%)	52.4	55.3
Mean participation score	2.43	2.18
Mean voice representation score	2.40	1.95
Average livelihood loss (%)	29.5	40.9
Average water stress (months/year)	2.7	2.8
Migration-related pressure (%)	26.2	42.1
Observed environmental degradation (%)	81.0	76.3

These results revealed that silence in the study area has manifested through poor information circulation, poor institutional participation as well as poor community representation. This trend formed a solid ground on which the socio-political aspect of vulnerability in the chosen communities could be explained.

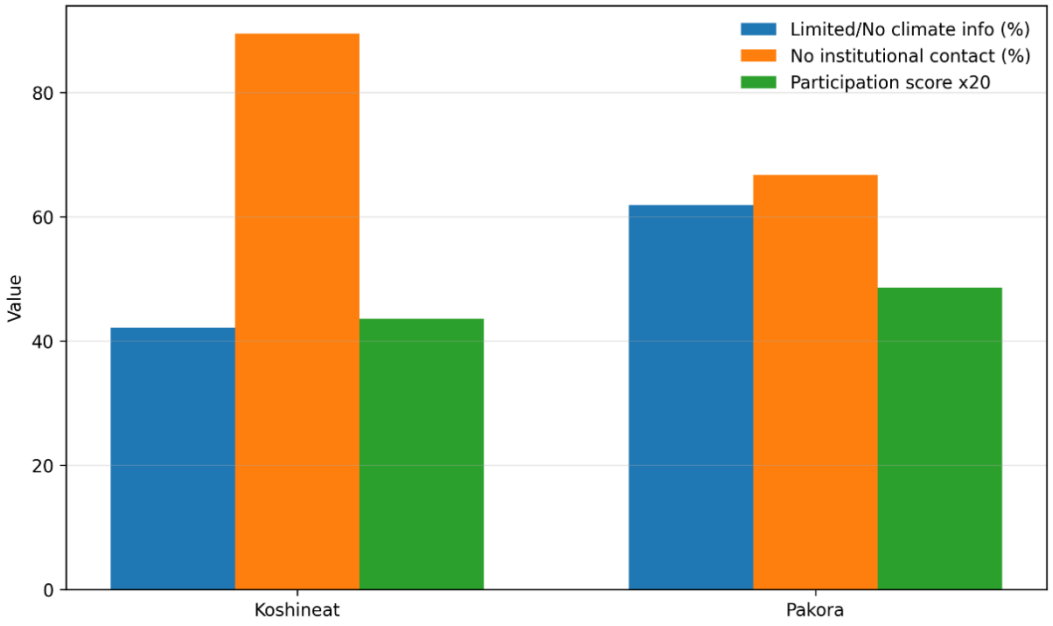


Figure 2. Village-wise comparison of institutional contact, climate information access, and participation score

4.2 Economic Vulnerabilities

The findings indicated that economic vulnerability was still strongly associated with livelihoods that are climate sensitive. The primary source of livelihood of over half of the respondents was agriculture and livestock and this indicated a high dependence on the state of the environment. This trend implied that households were extremely vulnerable to the harm that occurred due to floods, landslides, erosion, water shortage as well as loss of productive land.

According to the survey results, the estimated livelihood loss was on average 34.9%. This amount of loss was an indication of a heavy burden on economic stability of households.

Moreover, one-third of the respondents experienced migration-related pressure, which implied that livelihood pressure had already begun to affect household decision-making on matters of movement and income diversification. Another 31.2% of households were dependent on either wage labor or seasonal migration and this indicated that many households had already outgrown the traditional farming alone.

Table 4. Economic Vulnerability Indicators

Indicator	Frequency	Value
Households dependent on agriculture and livestock	45	56.2%
Average estimated livelihood loss (%)	N/A	34.9%
Respondents reporting migration-related pressure	27	33.8%
Households relying on wage labor or seasonal migration	25	31.2%

The village comparison also revealed that economic stress prevailed more in Koshineat. The mean estimated livelihood loss in Koshineat was 40.9% whereas it was 29.5% in Pakora. The pressure related to migration was also significantly greater in Koshineat. These results suggested that families in Koshineat experienced greater economic stress and had fewer local buffers to environmental and livelihood shocks.

Generally, the findings revealed that the economic susceptibility of the study region was not necessarily an issue of low income. It was directly related with the unstable livelihoods, frequent environmental degradation, and necessity to find coping mechanisms beyond the traditional local economy.

4.3 Environmental Vulnerabilities

The environmental results indicated that exposure to the natural hazards and environmental stress were high in the study area. Out of 80 respondents, 61 reported that they had experienced a severe hazard event during the last five years. This constituted 76.2% of the sample. Moreover, 63 respondents said that they had witnessed environmental degradation in their environment which was 78.8% of the sample. The mean number of hazard

exposures was 2.78; this indicated that many households had not been exposed to a single event only, but a number of forms of environmental stress in the long term.

The survey also showed that the average duration of water stress was 2.8 months per year. This finding indicated that environmental vulnerability extended beyond visible disasters such as floods and landslides. It also included seasonal water pressure and resource insecurity.

Table 5. Environmental Vulnerability Indicators

Indicator	Frequency	Value
Respondents reporting severe hazard experience in the last 5 years	61	76.2%
Respondents observing environmental degradation	63	78.8%
Average hazard exposure count	N/A	2.78
Average water stress duration (months/year)	N/A	2.8

These results showed that there were overlapping environmental pressures on the selected communities. There were also sudden events like floods and slope failures, but they co-existed with some gradual stresses like land degradation, erosion, seasonal water shortages. This implied that the vulnerability in the environment was both short term and long term.

The village level pattern revealed a finding where Koshineat indicated that there was a little more severe experience of hazard compared to Pakora whereas Pakora had indicated a little more degradation of the environment. This implied that the stresses of the environment had not spared

the two villages with or without necessarily being in the same form.

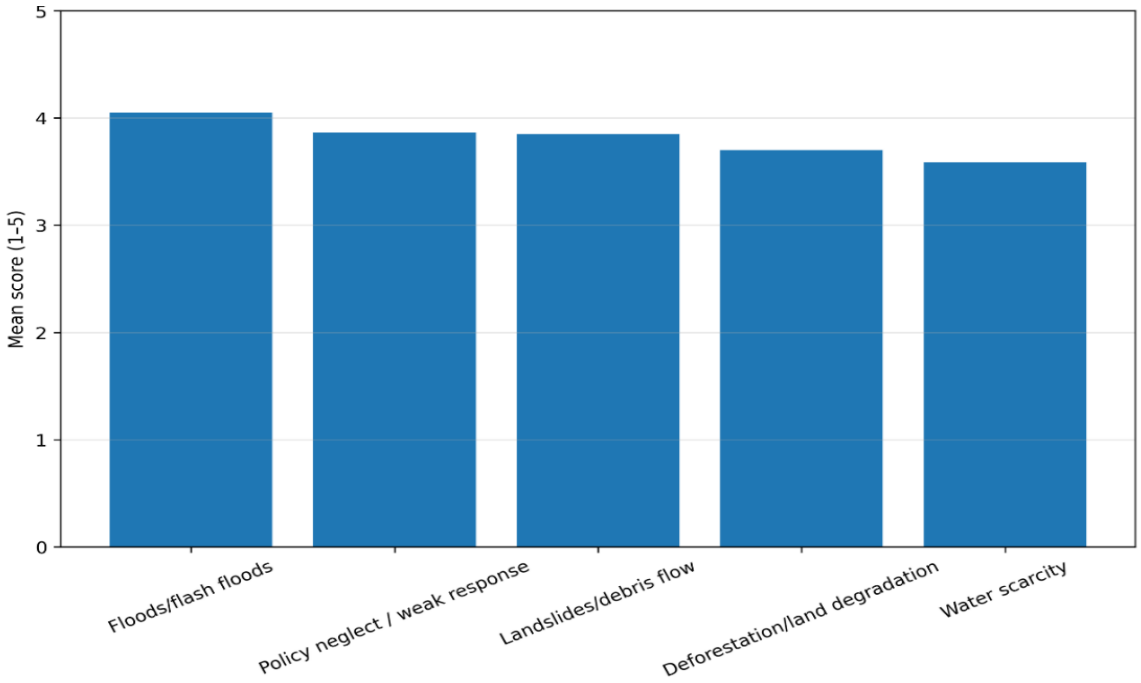


Figure 4.2: Distribution of reported environmental hazards and stress factors in the study area

4.4 Community Perceptions and Experiences

The findings on community perceptions showed that respondents viewed floods and flash floods as the most serious threat. This risk factor received the highest mean score of 4.05 out of 5. The second highest concern was policy neglect or weak institutional response, with a mean score of 3.86. Landslides and debris flow followed closely with a mean score of 3.85. Deforestation and land degradation scored 3.70, while water scarcity scored 3.59.

Table 6. Community Risk Perception Ranking

Rank	Risk factor	Mean score (1-5)
1	Floods/flash floods	4.05
2	Policy neglect / weak response	3.86
3	Landslides/debris flow	3.85
4	Deforestation/land degradation	3.70
5	Water scarcity	3.59

This ranking showed that there was community knowledge of vulnerability that was not limited to physical hazard. Environmental threats were not revealed as the only threats by the respondents. They also regarded poor response and poor policy attention in the problem. Such a discovery was significant since it had demonstrated that the vulnerability was perceived by the local people both environmentally and institutionally.

This outcome was facilitated by the interview findings. The key informant evidence revealed that local experience was influenced by frequent exposure to hazards, poor communication, slow response, and the increase of livelihood pressure. The most common broad theme of the interview record was also revealed as environmental risk and physical exposure, and the second one was information and communication gaps, institutional and governance gaps, and livelihood stress and migration pressure.

Table 7. Synthesized Key Informant Themes

Broad theme	Frequency	Summary interpretation
Environmental risk and physical exposure	4	Repeated floods, unstable slopes, erosion, and hazard concentration near channels and settlement edges were repeatedly reported.
Information and communication gap	3	Respondents highlighted weak access to practical climate information, late warning flow, and limited communication with vulnerable groups.
Institutional and governance gap	3	Respondents emphasized delayed response, weak local follow-up, and poor implementation of planning at community level.
Livelihood stress and migration pressure	2	Respondents linked environmental shocks with crop loss, income pressure, and movement for alternative livelihood.

The community narratives suggested that vulnerability had been experienced as a continuing condition rather than as a one-time disaster event. People connected floods, erosion, road blockage, crop loss, and information gaps into one larger pattern of insecurity. This pattern gave further strength to the argument that silence and vulnerability were interconnected.

4.5 GIS and Spatial Findings

The GIS screening showed that risk in the study area was not evenly distributed. It was instead gathered on steep slopes, banks of streams, along settlement edges, irrigation areas, and access roads. The greatest areas of risk were those where physical exposure and local land use were in direct conflict.

The GIS table indicated that three sites had been in the very high-risk category and three sites had been in the high-risk category. Two locations fell within the range of moderate-

risk. The Pakora as upper channel bank and Koshineat as steep slope hamlet and stream confluence area were classified as having very high risk of working conditions. These settlements were a combination of stress of slope, distance to water channels, and direct exposure of settlements or productive lands.

Table 8. GIS Risk-Screening Results

Site ID	Village	Location	Elevation (m)	Slope (°)	Distance to stream (m)	Dominant hazard	Risk class
GS-01	Pakora	Upper channel bank	3055	34	85	Flash flood / bank erosion	Very High
GS-02	Pakora	Lower settlement edge	3018	29	140	Debris flow	High
GS-03	Pakora	Link road crossing	2987	22	60	Seasonal washout	High
GS-04	Pakora	Irrigation intake zone	3030	18	95	Sediment blockage	Moderate
GS-05	Koshineat	Steep slope hamlet	3115	38	110	Landslide	Very High
GS-06	Koshineat	Stream confluence area	3088	27	70	Flash flood	Very High
GS-07	Koshineat	Forest fringe	3142	31	190	Slope instability	High
GS-08	Koshineat	Upper pasture access route	3205	24	155	Road blockage	Moderate

The spatial results showed that the most serious risk clusters appeared where water flow, slope instability, and local settlement or infrastructure intersected directly. These findings

also suggested that physical risk in the area had practical implications for transport, irrigation, settlement safety, and agricultural use of land.

The GIS pattern complemented the survey findings. Villages that showed stronger livelihood and institutional stress also contained several locations with high or very high spatial risk. Therefore, the spatial results strengthened the overall interpretation of layered vulnerability in the study area.

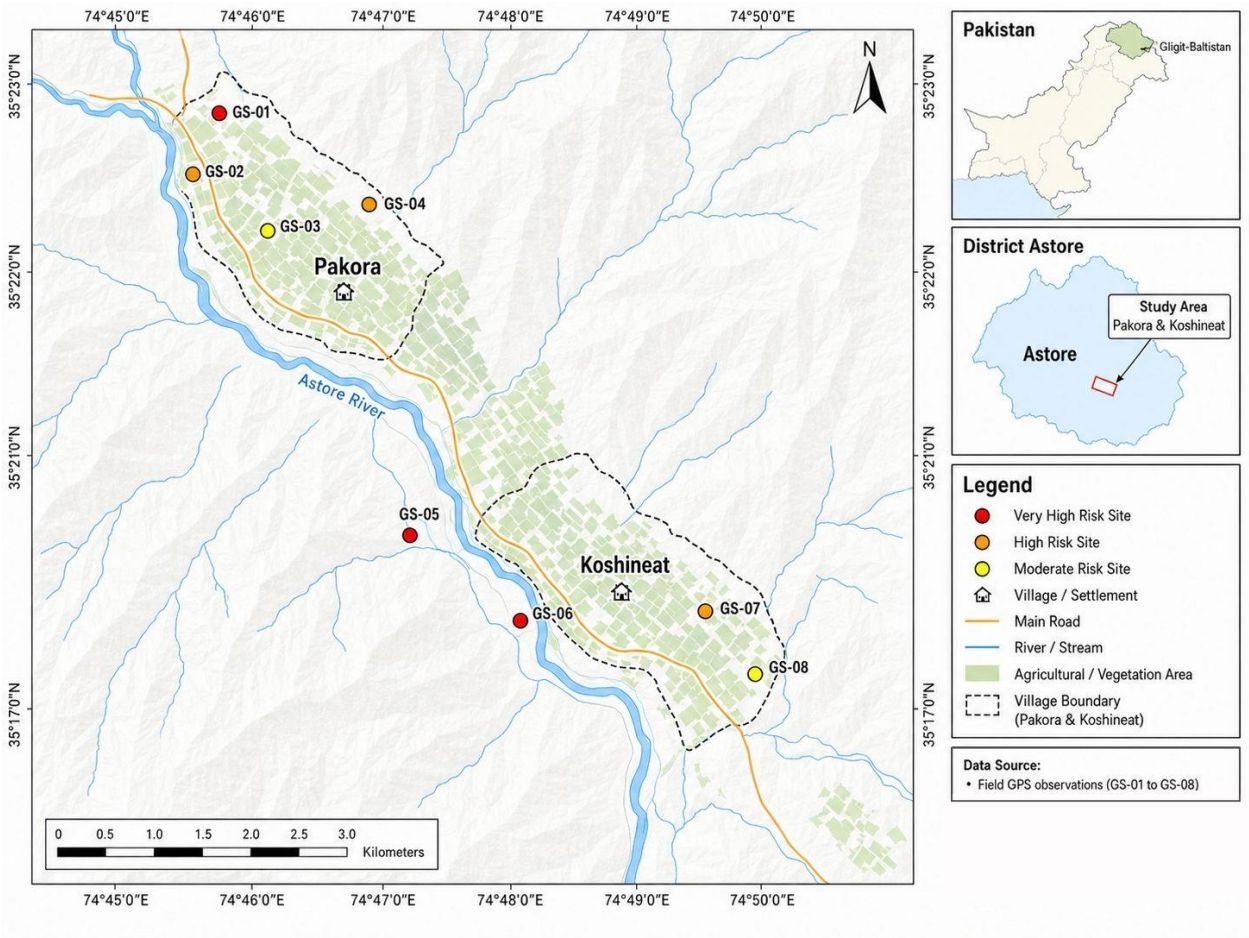


Figure 3. GIS-based vulnerability map showing moderate, high, and very high-risk locations in Pakora and Koshineat

4.6 Stakeholder Insights

The stakeholder consultation findings showed that participants prioritized practical interventions that could directly improve preparedness, communication, and local

resilience. Climate information and community training received the highest mean priority score of 4.5 out of 5. This was followed by early warning and preparedness and slope, water, and land management, both with a mean score of 4.4. Local institutions and inter-agency coordination received a mean score of 4.3, while community voice and inclusion received a mean score of 4.0.

Table 9. Stakeholder Priority Ranking

Priority action	Mean priority score (1-5)
Climate information and community training	4.5
Early warning and preparedness	4.4
Slope, water and land management	4.4
Local institutions and inter-agency coordination	4.3
Community voice and inclusion	4.0

These results showed that stakeholders viewed vulnerability reduction as a practical and multi-sector process. They did not identify one single solution. Instead, they emphasized a combination of technical preparedness, local information systems, natural resource management, and institutional strengthening. The relatively high score for community voice and inclusion also showed that stakeholder groups recognized the importance of participation, even though it ranked slightly below training and preparedness.

Overall, the stakeholder findings suggested that resilience planning in the study area would be more effective if it linked science, local institutions, and community action in one coordinated framework.

4.7 Discussion of Major Findings

The findings of this chapter indicated that the susceptibility of the sampled communities had been intersecting and cross dimensional. The findings did not endorse any limited approach whereby the local insecurity was solely attributed to the environment hazards. Rather, the results indicated that exposure to the environment, livelihoods dependency,

poor institutional attachment, low access to information and low representation of the community interacted to create a wider vulnerability condition.

This multidimensional pattern is consistent with recent mountain-adaptation research showing that climate vulnerability is produced through interacting environmental, socioeconomic, livelihood, infrastructure, and institutional pressures rather than through climatic hazards alone (Muccione et al., 2024; Kapruwan et al., 2025).

A significant conclusion of this was that social-political vulnerability was still serious. The findings indicated that a very high percentage of the respondents did not have access to climate information (or limited access) and a greater percentage did not have any contact with institutions. The fact that the participation and voice representation scores were low also demonstrated that local people had no great sense of inclusion within the planning and response systems. This implied that silence within the study space manifested itself in the form of practical barriers to information, communication and inclusion as opposed to symbolic absence by itself.

This finding is consistent with Shah and Rana (2023), who identified limited public participation, weak institutional capacity, inadequate risk-based planning, and restricted access to vulnerable locations as important disaster-risk-management challenges in the Hindu Kush-Karakoram-Himalayan region. Similarly, Fatima et al. (2025) reported continuing gaps in localized climate-policy implementation and public climate education in Gilgit-Baltistan, emphasizing community engagement and inclusive policymaking as essential for resilience.

The second significant discovery was that economic vulnerability was still closely connected with environmental dependence. Because over half of the households depended on agriculture and livestock, the alterations in the water availability, the land quality, the slope stability and the exposure to hazards directly influenced the stability of the household. The livelihood loss was still high on average and the pressure due to migration could also be observed. These trends revealed that economic stress was not only past temporary loss but it began to affect household coping behavior.

Comparable findings have been reported from other mountain communities in Gilgit-Baltistan. Ali et al. (2024a) found that landslides, flash floods, and other climate-related events disrupted agriculture and livelihood opportunities in remote mountain villages, while Ali et al. (2024b) reported reduced irrigation water, declining crop yields, and substantial climate-related pressures on land-based livelihoods in District Nagar. Tuladhar et al. (2023) similarly demonstrated that changes in water availability, precipitation, temperature, and seasonal patterns were directly affecting agriculture and livelihoods in the Upper Indus Basin.

The third significant conclusion was that environmental vulnerability was still prevalent and repeated. The majority of the respondents had encountered a severe hazard within the past five years, and a significant proportion of the respondents had also witnessed the degradation of the environment. This implied that the communities were not handling individual cases. Rather they were existing in a cycle of physical stress, which was composed of both emergency disasters and a slow deterioration of the environment.

This pattern agrees with recent evidence from Gilgit-Baltistan showing that remote mountain settlements experience recurrent and overlapping climatic hazards rather than isolated events. Ali et al. (2024a) documented exposure to landslides, flash floods, and glacial lake outburst floods, while Khan et al. (2024) demonstrated continuing land-surface and ecological changes across mountainous areas of Gilgit-Baltistan associated with climatic and anthropogenic pressures.

The results of the perception gave a new significant dimension. The most highly perceived threat was still floods and flash floods, though policy neglect and poor response to the same ranked almost on par. This meant that the local individuals never drew a line between environmental risks and the governance performance. To them, physical danger was a vulnerability, coupled with lack of support at the right time and in the right manner.

The high perceived importance of floods and flash floods is also consistent with Shah, Rana, and Ali (2023), whose multi-hazard study in Gilgit found that respondents perceived flood and GLOF impacts on daily life more strongly than other major hazards. Their

findings also emphasized that understanding community risk perception is fundamental for preparedness and disaster-risk-reduction planning.

This was further reinforced by the GIS results indicating that risk was localized in specific terrain environments. The primary high-risk areas emerged to be the banks of streams, steep slope settlements, areas of confluence and the areas having delicate accesses. This implied that physical geography in the study area had a distinct vulnerability. Nonetheless, the social and institutional evidence indicated that this physical geography was linked to imbalanced preparedness, poor institutional contact, and local capacities.

The spatial concentration of vulnerability observed in the present study is supported by recent geospatial research in Gilgit-Baltistan demonstrating that mountain environments are undergoing significant land-surface and ecological changes that have implications for sustainable planning and environmental management (Khan et al., 2024). Shah and Rana (2023) further emphasized that inadequate land-use planning and the absence of risk-based planning can intensify disaster vulnerability in remote mountainous settlements.

The comparison of the village also revealed that the vulnerability was not evenly spread. Koshineat continuously exhibited poorer institutional contact, reduced participation and voice representation, increased loss of livelihood, and more significant pressure to migrate. It implies that vulnerability was still discriminated even within the same larger study context. This had an impact as it implied that not all communities should be the same in terms of the level of exposure and readiness to be addressed by local planning.

Such within-region differences are plausible in mountain environments because vulnerability and adaptive capacity are strongly influenced by local geography, livelihood characteristics, resource access, and socioeconomic conditions. Ali et al. (2024b), for example, demonstrated that household and farming characteristics influenced perceived climate impacts among high-mountain communities in Gilgit-Baltistan, supporting the need for locally differentiated rather than uniform resilience interventions.

The findings of the stakeholder consultation were helpful in offering a viable course of action. The stakeholders placed the utmost importance on climate information and

community training, early warning and preparedness, and land and water management. These priorities implied that knowledge and local preparedness, environmental management, and institutional coordination were to be combined to be effective in enabling the vulnerability reduction. The results therefore advocated the necessity of a science based and community based framework.

These priorities are consistent with contemporary mountain-adaptation literature. Muccione et al. (2024) identified education and awareness, land-use practices, and collaborative adaptation as prominent components of mountain resilience interventions, while Kapruwan et al. (2025) concluded that effective climate adaptation in mountain regions requires coordinated multi-sectoral responses rather than isolated sectoral actions. Scotti et al. (2023) further emphasized the importance of actively involving local actors and integrating situated local knowledge with expert knowledge in resilience planning.

The combined findings indicated that silence and vulnerability had mutually supported one another. Poor access to information, poor engagement, and poor institutional contact raised the vulnerability of the community. Simultaneously, the capability to make their concerns visible and influence response systems through their repeated contact with hazards and livelihood pressure diminished the capacity of communities. This cycle has generated the necessity of having a framework that would bridge the evidence, participation, and action in a more structured manner.

This interpretation is supported by research emphasizing that community agency, access to knowledge, participation, and institutional inclusion are central components of climate resilience in mountain settings (Scotti et al., 2023). In the context of Gilgit-Baltistan, Fatima et al. (2025) similarly emphasized that stronger community education, stakeholder engagement, and inclusive policy processes are necessary to translate climate policy into effective local action.

4.8 Science-Based Manifesto Framework

Based on the findings, a science-based manifesto framework was developed for the selected communities of District Astore, especially Pakora and Koshineat. The framework was

prepared in response to the main issues identified in the results, namely weak community voice, low information access, weak preparedness, unstable livelihoods, environmental stress, and uneven institutional reach.

The development of an integrated framework was also consistent with recent evidence advocating locally grounded, participatory, and multi-sectoral adaptation approaches for mountain communities (Muccione et al., 2024; Kapruwan et al., 2025).

Table 10. Science-Based Manifesto Framework

Manifesto pillar	Main issue identified	Proposed action	Expected outcome
Community voice and inclusion	Low participation and weak representation	Establish village-level consultation forums and ensure inclusion of women, youth, and local elders in planning	Improved community participation and stronger local ownership
Climate information and awareness	Limited access to usable climate information	Organize local awareness sessions, seasonal risk briefings, and community-based information dissemination	Better risk understanding and improved preparedness
Early warning and preparedness	Weak warning access and delayed response	Strengthen local warning chains, preparedness drills, and household response planning	Faster local response and reduced hazard loss
Slope, water and land management	Repeated erosion, unstable slopes, and water-related damage	Promote slope stabilization, drainage improvement, channel maintenance, and protective local measures	Lower environmental exposure and stronger local protection
Livelihood resilience	High livelihood dependence and repeated loss	Support diversified income options, resilient farming practices, and local resource protection	Reduced livelihood stress and stronger adaptive capacity

Local institutions and coordination	Weak institutional contact and poor follow-up	Improve coordination among local administration, disaster actors, NGOs, and community groups	Better service delivery and stronger implementation
Evidence-based planning	Need for targeted action	Use field evidence and GIS-based screening in local planning and risk prioritization	More practical and location-specific resilience planning

The framework showed that resilience within the study area would not be simple with general policy statements only. It would involve a local system which connected science, local evidence and real-world planning. As indicated by the findings of this chapter, the communities required timely information, stronger warning systems, improved inclusion, improved land and water management, and improved coordination between the local institutions and communities. Thus, the manifesto structure was created in reaction to the social, economic, environmental, and spatial realities that were observed in the findings.

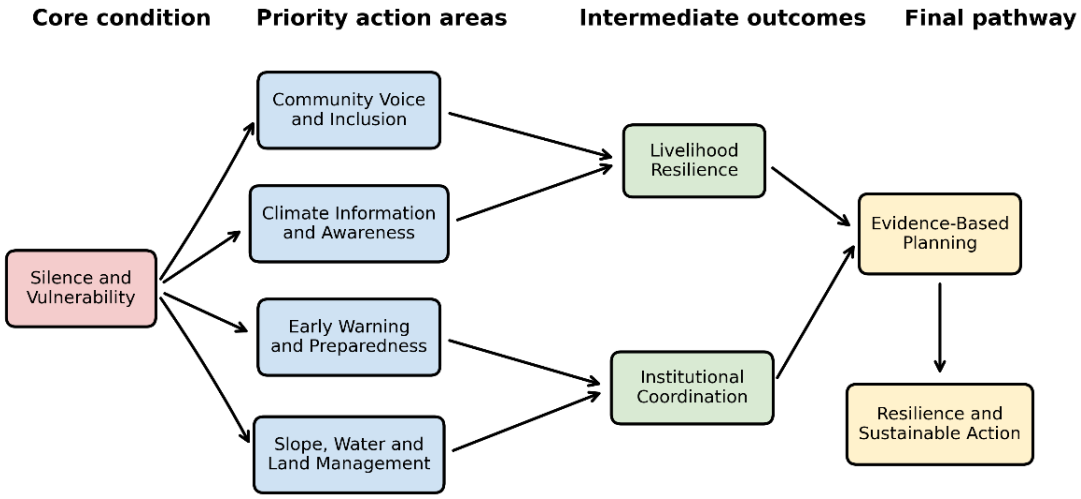


Figure 4. Diagram of the science-based manifesto framework showing the links among silence, vulnerability, participation, evidence, and resilience

Chapter 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study concluded that vulnerability in Pakora and Koshineat was not primarily the outcome of environmental hazards alone; rather, it resulted from the interaction of environmental exposure, livelihood dependence, limited institutional engagement, restricted access to climate information, and weak community participation. Results thus validated the multidimensional nature of vulnerability in these remote mountain communities and the influence of social and institutional factors on the ability of households to prepare for, respond to, and recover from environmental risks.

One of the main findings of the study was that silence was part of the vulnerability and was also a result of it. Limited representation, weak information flows, and inadequate institutional contact reduced the ability of communities to influence planning and preparedness, while repeated hazard exposure and livelihood pressures further weakened their capacity to participate effectively. The tendency of Koshineat to be more vulnerable relative to the other populations also further showed that vulnerability was locally differentiated and uniform interventions were not required.

The study consequently established that effective resilience planning in the selected communities required the integration of community voice, scientific evidence, spatial risk information, livelihood resilience, preparedness, and institutional coordination. The science-based manifesto that was created by these findings was the main practical contribution of the research as it translated the identified vulnerabilities into an integrated framework for locally grounded action. Overall, the study illustrated that vulnerability reduction among remote mountain communities was not a purely physical hazard management issue, but also had to include the institutional, informational, economic and participatory conditions that enabled vulnerability to persist.

5.2 Recommendations

On the basis of the findings of this study, the following recommendations were made.

5.2.1 Policy and Institutional Recommendations

- The local governments and the concerned departments need to enhance their interaction with the remote communities like Pakora and Koshineat. Regular contact, local follow-up and increased visibility in climate and disaster related planning should be used to improve institutional outreach.
- The consultation mechanisms at the village level must be put in place in a manner that allows the local people to include women, the youth, the elders and the vulnerable households in the resilience planning as well as the local development decisions.
- The district and tehsil level should be integrated to be more active in climatic change, disaster risk reduction, and local development planning. The analysis demonstrated that environmental risk, livelihood stress and weak governance were closely interrelated hence they must be dealt with together in the course of coordination instead of responding differently.
- The collaboration between local administration, disaster management organizations, environmental protection institutions, technical units and community organizations needs to be enhanced in the form of inter-agency coordination.
- A centralized system would enhance the communication, readiness and local execution.

5.2.2 Community-Level Recommendations

- There should be the introduction of community-based awareness programs aimed at enhancing the public knowledge about the risks of climate, the hazard patterns in the area, and the preparedness that is available,such activities must be written in easy to understand and local language.
- They should also strengthen local early warning systems to ensure that the community members have access to valuable and timely information prior to the

occurrence of hazards,the local communication chains and community preparedness drills should support the warning systems.

- In the study area, women, the youth, and other less-heard should be given special attention,they should be involved in local decision-making since the vulnerability was not equally felt by all the groups.
- Risk mapping, seasonal planning, and resource protection activities have to be encouraged by promoting the involvement of local communities,community participation would be more beneficial in creating less silence and enhancing ownership of resilience measures.

5.2.3 Environmental and Livelihood Recommendations

- The local mitigation planning should focus on high-risk areas that have been identified with the help of field and GIS based assessment. Slope stabilization, drainage betterment, stream-bank protection and less hazardous settlement or route planning should be given attention in these areas as much as possible.
- The local interventions should enhance water management by ensuring that the sources are protected, loss is minimized during the season, and the irrigation and supply systems are maintained.
- Practical local solutions to land degradation and environmental stress include vegetation support, land use control, slope management and community-based conservation of susceptible environmental areas.
- Diversification of livelihoods needs to be promoted such that the households do not solely rely on climate sensitive agricultural production. This can be a favored subsidy to small enterprise, less risky local income and skill-based alternatives where practical.

5.2.4 Scientific and Technical Recommendations

- Science should be made to make use of the information as it is translated to be of use to communities. The knowledge about climate, information on hazards, and

preparedness advice cannot be confined to reports and policy documents,they ought to be conveyed in a realistic manner on the community level.

- The local planning should include GIS and field-based screening because the interventions can be prioritized based on the physical risk conditions.
- They need to offer further technical assistance to community level, where the hazards should be assessed, local monitoring and safe routes planning, critical infrastructure as well as sensitive settlement areas.
- Science-based manifesto as suggested in this study should be applied as a guiding framework on pilot action in the chosen communities,local validation and gradual implementation might enhance its usefulness even more.

5.3 Future Research Directions

This study opened several directions for future research.

- Future researchers must employ primary field data through a more extensive sample of villages in District Astore as well as in other districts as Gilgit-Baltistan. this would assist in the comparison of the patterns of vulnerability in various mountain settings.
- A comparative study needs to be conducted between more accessible and less accessible villages to determine the influence of remoteness and service in accessibility on the phenomenon of silence, vulnerability, and resilience.
- In future research, gendered experiences of vulnerability should be studied more thoroughly, particularly, how women can gain information, be involved in planning, and how women can be subjected to environmental and livelihood stress.
- The longitudinal studies are to be conducted and the environmental change, the pressure of migration and the local adaptation to be studied over time and not just by a single time measurement.
- The effective application of the science-based manifesto in community should also be put to test in subsequent studies.
- This type of research may evaluate the ability of the framework to enhance local engagement, readiness, and resilience when applied using real programs.

- Finally, GIS-based and mixed-methods research in the future should strive to bridge the gap between the spatial risk assessment and the knowledge of communities in a way that would make the vulnerability of the mountains more realistic and addressed in a more effective way.

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Appendices

Appendix I: Questionnaire

Tistle of Study:

Silence and Vulnerability in Mountain Communities of District Astore, Gilgit-Baltistan: A Science-Based Manifesto

Instructions for Respondent:

The following questionnaire was aimed at gathering data about the situation in the community, environmental risk, access to information, livelihood problems, and the attitude towards the vulnerability in the chosen villages. The data collected by the respondents was confidential and could only be utilized academically.

Section A: Basic Information

1. Respondent ID: _____
2. Village:
   ☐ Pakora
   ☐ Koshineat
3. Gender:
   ☐ Male
   ☐ Female
4. Age: _____ years
5. Marital status:
   ☐ Single
   ☐ Married
   ☐ Widowed
   ☐ Other
6. Education level:
   ☐ No formal education
   ☐ Primary

☐ Secondary

☐ Higher secondary

☐ Graduate and above

7. Occupation:

☐ Agriculture

☐ Livestock

☐ Wage labor

☐ Business

☐ Government/private job

☐ Other _____

8. Household size: _____

Section B: Livelihood and Economic Conditions

9. What was the main source of livelihood of your household?

☐ Agriculture

☐ Livestock

☐ Wage labor

☐ Small business

☐ Service

☐ Seasonal migration

☐ Other _____

10. Was your household livelihood affected by floods, landslides, or other environmental hazards?

☐ Yes

☐ No

11. If yes, what type of loss was experienced?

☐ Crop loss

☐ Livestock loss

☐ House damage

☐ Road/access damage

☐ Loss of income

☐ Other _____

12. Approximately what percentage of livelihood loss was faced by your household?

☐ Less than 10%

☐ 10-25%

☐ 26-50%

☐ More than 50%

13. Did any household member migrate for livelihood reasons?

☐ Yes

☐ No

Section C: Environmental Conditions and Risk Exposure

14. Have you experienced any major hazard in the last five years?

☐ Yes

☐ No

15. If yes, which hazard was most serious?

☐ Flood

☐ Flash flood

☐ Landslide

☐ Erosion

☐ Water shortage

☐ Other _____

16. How often did environmental hazards affect your village?

☐ Rarely

☐ Sometimes

☐ Often

☐ Very often

17. Have you observed environmental degradation in your area?

☐ Yes

☐ No

18. If yes, what type of environmental change did you observe?

☐ Soil erosion

☐ Deforestation

☐ Reduced water availability

☐ Slope instability

☐ Land degradation

☐ Other _____

19. For how many months in a year did your household face water stress?

☐ None

☐ 1-2 months

☐ 3-4 months

☐ More than 4 months

Section D: Information, Institutions, and Participation

20. Did you have access to climate-related information?

☐ Regularly

☐ Limited

☐ None

21. What was your main source of information?

☐ Local people

☐ Government officials

☐ Social media

☐ Radio/TV

☐ NGO

☐ Other _____

22. Did any institution contact your village in the last 12 months regarding climate or disaster preparedness?

☐ Yes

☐ No

23. Did your household have access to any early warning system?

☐ Yes

☐ No

24. Were you involved in any local discussion or meeting regarding village risks or development?

☐ Yes

☐ No

25. How would you rate your participation in local decision-making?

☐ Very low

☐ Low

☐ Moderate

☐ High

☐ Very high

26. How would you rate the representation of your community voice in planning and response?

☐ Very low

☐ Low

☐ Moderate

☐ High

☐ Very high

Section E: Perceptions of Vulnerability

28. In your opinion, what was the main cause of vulnerability in your area?
    - ☐ Environmental hazards
    - ☐ Weak infrastructure
    - ☐ Poverty and livelihood problems
    - ☐ Lack of information
    - ☐ Weak institutional support
    - ☐ All of these
29. What was the most urgent need of your village?
    - ☐ Better early warning
    - ☐ Better roads and access
    - ☐ Better water management
    - ☐ Better livelihood support
    - ☐ Better representation in planning
    - ☐ Other _____
30. Any additional comments:

Appendix II: Interview Guide

Title of Study:

Silence and Vulnerability in Mountain Communities of District Astore, Gilgit-Baltistan: A Science-Based Manifesto

Purpose of Interview:

This interview guide was used to collect detailed information from key informants regarding socio-political, economic, and environmental vulnerabilities in the study area.

Part A: Introduction

1. Please introduce yourself briefly.
2. What is your role in the community or institution?
3. How long have you been associated with this area?

Part B: Local Context and Vulnerability

4. In your view, what were the main problems faced by the people of Pakora and Koshineat?
5. What types of environmental hazards were most common in this area?
6. How had these hazards affected daily life, housing, roads, water, agriculture, or livestock?
7. Which groups in the community appeared more vulnerable, and why?

Part C: Silence and Marginalization

8. Do you think the voices of local communities were adequately heard in development or climate-related planning? Why or why not?
9. In what ways did silence or underrepresentation appear in this area?
10. Were women, youth, and poor households included in local decision-making?
11. Did people have the confidence and opportunity to communicate their concerns to authorities?

Part D: Information and Institutional Support

12. How did people usually receive information about hazards and climate risks?
13. Was the available information timely and useful?
14. What role did local institutions play in risk reduction and preparedness?
15. What were the main weaknesses in institutional response?

Part E: Livelihood and Adaptation

16. How had environmental changes affected local livelihoods?
17. What coping or adaptation strategies were used by households?
18. Had migration increased in response to environmental or economic stress?
19. Which local strengths or traditional practices helped communities deal with risk?

Part F: Recommendations and Manifesto Development

20. What should be the top priority for improving resilience in these villages?
21. What kind of support did the communities need most urgently?
22. How could science, local knowledge, and policy be combined more effectively?
23. What recommendations would you suggest for a science-based manifesto for this area?

Closing

24. Is there anything else you would like to add?

Appendix III: Consent Form

Title of Study:

Silence and Vulnerability in Mountain Communities of District Astore, Gilgit-Baltistan: A Science-Based Manifesto

Researcher:

_____

Institution:

_____

Participant Information

You are invited to participate in a research study about silence and vulnerability in mountain communities of District Astore, Gilgit-Baltistan. This study aims to learn about the socio-political, economic, and environmental issues of local communities and to create a science-based manifesto of resilience and sustainable action.

Your participation in this study is voluntary. You are at liberty not to take part or to leave the study at any point without penalty. The data you give will remain confidential and will only be utilized to carry out academic research.

Participation Details

If you agree to participate, you may be asked to:

- Answer questions in a questionnaire
- Participate in an interview
- Share your views on local environmental and livelihood conditions

There will be no purposeful harm in the study. Leading questions might however require you to consider tough experiences in regard to hazards or livelihood issues. You can leave any question that will not make you feel comfortable.

Confidentiality

No information about your name will be given in the final thesis. The data that is obtained about you will not be disclosed to any third party and will only be used in the research.

Consent Statement

I have read and comprehended the information that is presented above. I know my attendance is voluntary and I can leave anytime. I consent to take part in this research.

Name of Participant: _____
Signature/Thumb Impression: _____
Date: _____

Name of Researcher: _____
Signature: _____
Date: _____