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CLIMATE CHANGE AS A MAJOR NON-TRADITIONAL SECURITY CHALLENGE IN GILGIT-BALTISTAN: RISKS, IMPACTS, AND POLICY RESPONSES

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Abstract

Climate change has emerged as a major non-traditional security challenge in Gilgit-Baltistan (GB), threatening human security, livelihoods, infrastructure, water resources, food security, and regional development. As a mountainous region located in the Hindu Kush–Karakoram–Himalayan (HKH) system, GB is particularly vulnerable to rising temperatures, accelerated glacier and snow melt, glacial lake outburst floods (GLOFs), flash floods, landslides, droughts, water scarcity, and changing precipitation patterns. These environmental hazards have consequences that extend beyond ecological degradation and increasingly affect economic stability, migration, public health, social cohesion, and state capacity. Climate-induced disasters can also disrupt the Karakoram Highway, energy infrastructure, agriculture, tourism, and communities located in remote valleys. This study conceptualizes climate change through a non-traditional security and human security framework and examines its major risks, socioeconomic impacts, and governance challenges in GB. It argues that climate change should no longer be treated solely as an environmental issue but as a multidimensional security challenge requiring coordinated responses from government institutions, local communities, researchers, civil society, and development partners. The study recommends strengthening climate-resilient infrastructure, early-warning systems, disaster preparedness, water management, community-based adaptation, climate-smart agriculture, ecosystem protection, and institutional coordination. A comprehensive climate-security strategy for GB is essential for protecting vulnerable communities and ensuring sustainable development.

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Introduction

Climate change is increasingly recognized as one of the most serious non-traditional security challenges of the twenty-first century. Unlike traditional security threats, which primarily focus on military conflict and territorial sovereignty, non-traditional security threats include environmental degradation, pandemics, food insecurity, water scarcity, energy insecurity, displacement, and natural disasters. Climate change is particularly significant because it can intensify several of these challenges simultaneously. Its effects can undermine livelihoods, increase poverty, place pressure on state institutions, and create conditions for social instability (Ehsan 2025).

Gilgit-Baltistan is particularly exposed to climate-related risks because of its geographical location, fragile mountain ecosystems, and dependence on natural resources. The region contains some of the world's largest glaciers outside the Polar Regions and is characterized by steep mountains, narrow valleys, high-altitude settlements, and rivers fed by snow and glacial melt. These geographical characteristics provide important water resources but also expose communities to hazards associated with climate variability and accelerated environmental change. Temperature increases in the mountainous regions of northern Pakistan can influence the stability of glaciers, snow cover, permafrost, and glacial lakes. The expansion or destabilization of glacial lakes can increase the risk of GLOFs, while intense rainfall and rapid snowmelt can trigger flash floods and landslides. Such events can destroy houses, agricultural land, roads, bridges, electricity infrastructure, and communication networks. Remote communities may remain isolated for extended periods after disasters. Climate change also has significant implications for water security. GB is a major source of water for downstream regions of Pakistan through the Indus River system. Changes in glacier dynamics and precipitation patterns may alter the timing and availability of water. While increased melting can temporarily increase water flows, long-term glacier loss may threaten water availability during periods when communities and downstream agriculture depend heavily on meltwater. The socio-economic consequences of climate change are equally important. Many communities in GB depend on agriculture, livestock, tourism, trade, forestry, and small-scale businesses. Climate-related disasters can reduce agricultural productivity, destroy orchards, interrupt tourism activities, and damage transport infrastructure. Consequently, climate change can increase household vulnerability and deepen existing socioeconomic inequalities. Climate change also presents a human security challenge. The human security approach focuses on protecting individuals and communities from threats to survival, livelihoods, dignity, health, food, water, and economic well-being. From this perspective, a flood that destroys a village or a landslide that cuts off a community is not simply an environmental event; it is a security crisis affecting human life and development. (Ali 2026). The strategic importance of GB further increases the significance of climate security. The region is connected to major national infrastructure, including the Karakoram Highway and projects associated with the China-Pakistan Economic Corridor (CPEC). Climate-induced damage to transportation, energy, communication, and other infrastructure can have implications for regional connectivity and economic development. Therefore, climate change in GB requires a broader security perspective. Effective responses should combine environmental protection, disaster risk reduction, resilient infrastructure, community participation, scientific research, and institutional coordination. This study examines climate change as a major non-traditional security challenge in GB and evaluates its risks, impacts, and possible policy responses. The central problem is therefore the absence of a sufficiently integrated climate-security approach capable of connecting environmental risks with human security, economic stability, infrastructure

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protection, food and water security, migration, and regional development. (Rasool 2025).

Theoretical Framework: Non-Traditional Security Approach

The non-traditional security approach expands the concept of security beyond military threats. It recognizes that environmental degradation, climate change, natural disasters, food insecurity, pandemics, and resource scarcity can threaten individuals, communities, states, and regional stability. The Climate change represents a particularly important non-traditional security threat because it is multidimensional and transboundary. It can produce direct threats, such as floods and landslides, as well as indirect consequences, such as poverty, displacement, resource competition, and infrastructure disruption. (Hassan 2024).

Major Climate-Related Risks in Gilgit-Baltistan

Glacier Melting in Gilgit-Baltistan

Glacier melting has become one of the most significant climate-related challenges in Gilgit-Baltistan (GB), where glaciers are essential sources of freshwater for local communities, agriculture, hydropower, and downstream river systems. Rising temperatures and changing precipitation patterns are accelerating glacier retreat and altering the seasonal availability of meltwater. Increased glacial melting can also contribute to the formation and expansion of glacial lakes, raising the risk of Glacial Lake Outburst Floods (GLOFs). These floods can cause severe damage to settlements, agricultural land, roads, bridges, irrigation channels, and other critical infrastructure. The consequences of glacier melting extend beyond environmental degradation and represent a broader human-security concern. In the short term, increased meltwater may raise flood risks, while long-term glacier loss can threaten water availability during dry seasons. Communities dependent on agriculture, livestock, tourism, and natural water resources are particularly vulnerable. Glacier-related hazards can also disrupt transportation and economic activities and contribute to displacement and livelihood insecurity. Therefore, effective glacier monitoring, early-warning systems, climate-resilient infrastructure, watershed protection, and community-based adaptation are essential for reducing the security risks associated with accelerating glacier change in Gilgit-Baltistan. Glacier retreat and changing glacier dynamics are among the most important climate-related concerns in GB. Rapid warming can alter glacier mass balance and increase the instability of glacial systems. Glacier change can affect both immediate flood risks and long-term water availability. (Caballero-Anthony 2016).

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The graphic above shows a 2020–2026 glacier-melting trend, but an important correction for academic use: the 1,650 m–2,350 m "melting point" values shown are illustrative, not verified annual measurements for Gilgit-Baltistan. I would not use those numbers as empirical findings in your research paper. it is better to use actual glacier mass-balance or glacier-area data. The Copernicus/WGMS dataset provides annual glacier mass-change data, while Pakistan's 2026 satellite monitoring confirms ongoing changes in glacial lakes in GB.

Glacial Lake Outburst Floods

Glacial Lake Outburst Floods (GLOFs) are among the most significant climate-related hazards affecting mountainous regions such as Gilgit-Baltistan. A GLOF occurs when water accumulated in a glacial lake is suddenly released due to the failure or overtopping of a natural dam composed of ice, rock, or sediment. Rising temperatures contribute to glacier melting and the formation and expansion of glacial lakes, increasing the potential for sudden flooding. In Gilgit-Baltistan, the region's extensive glaciers, steep valleys, and fragile mountain environment create particular exposure to GLOF hazards. Such events can occur rapidly and carry large volumes of water, debris, and sediment downstream, making them difficult for vulnerable communities to predict and manage. (M. B. Ali 2026).

The impacts of GLOFs extend beyond immediate environmental destruction and represent a broader non-traditional security and human security challenge. Floods can damage homes, roads, bridges, agricultural land, irrigation systems, electricity infrastructure, and communication networks, while also disrupting local livelihoods and access to essential services. Repeated climate-related disasters can increase food and livelihood insecurity and contribute to temporary or permanent displacement of affected populations. Consequently, effective responses require more than emergency relief; they also

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involve early-warning systems, risk assessment, community preparedness, resilient infrastructure, glacier and glacial-lake monitoring, and coordinated disaster-risk governance. Strengthening these measures can help reduce vulnerability and enhance the resilience of communities across Gilgit-Baltistan. (Hussain 2025).

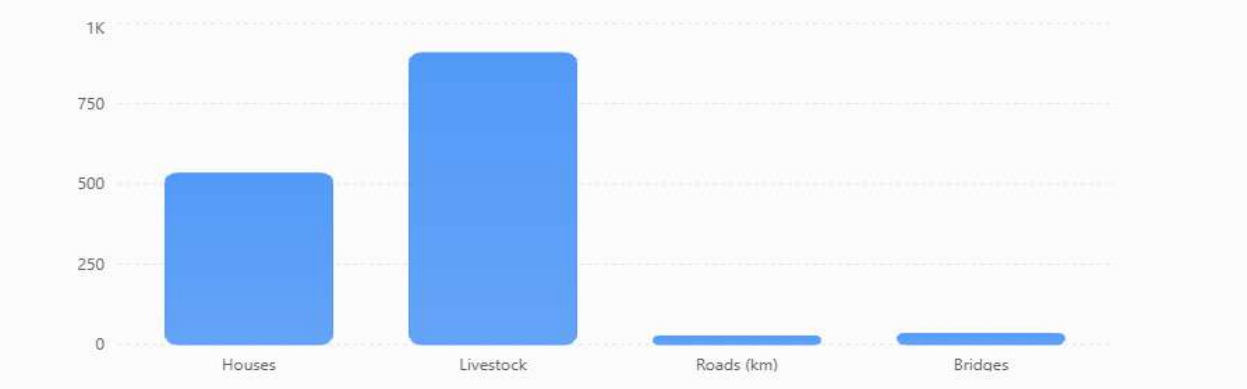
Flash Floods in Gilgit-Baltistan (2025–2026)

Flash floods became a major environmental and human-security challenge in Gilgit-Baltistan during 2025–2026, with communities facing repeated flooding associated with intense rainfall, cloudbursts, rapid snow and glacier melt, and GLOF-related events. In August 2025, flash floods affected several parts of the region, causing deaths and injuries, displacing residents, and damaging roads, bridges, electricity, mobile and internet networks. The floods also stranded local residents and tourists and disrupted connectivity between different districts. In 2026, the situation continued, with the National Disaster Management Authority warning of increased risks from flash floods, GLOFs and landslides because of above-normal temperatures, rapid glacier and snowmelt, and changing weather conditions. (Shafiq 2025).

During July–August 2026, flash floods and GLOFs caused extensive disruption across districts including Ghizer, Hunza, Nagar, Gilgit, Diamer, Astore, Skardu, Ghanche and Rondu. Floodwaters and debris damaged houses, agricultural land, roads, bridges and other infrastructure, while several valleys were temporarily cut off from the rest of the region. In July, repeated flooding damaged access routes in areas such as Hisper, while authorities reported interruptions to electricity, drinking water and communication services. In August, further flash floods triggered by cloudbursts and rapid glacial melting damaged homes, roads, bridges and agricultural land, with the Karakoram Highway also temporarily closed at affected locations. These events demonstrate how climate-related hazards can threaten not only the physical environment but also human security, livelihoods, food security, transportation, public services and community resilience in Gilgit-Baltistan. (Mumtaz 2026).

Flash-Flood Damage in Gilgit-Baltistan, 2026

Cumulative reported damage from 26 June to 21 September 2026.



Sources: National Disaster Management Authority (NDMA), Monsoon Sitrep 2026.

Landslides and Rock falls

Landslides and rock falls are significant climate-related hazards in Gilgit-Baltistan because of its steep mountainous terrain, fragile geological formations, intense rainfall, rapid snow and glacier melting, and frequent freeze–thaw

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processes. Landslides occur when masses of soil, rocks, or debris move downslope, while rock falls involve the sudden detachment and downward movement of rocks from steep mountain slopes. Climate change can increase the frequency or intensity of these hazards by altering precipitation patterns, accelerating glacier and snow melt, and weakening mountain slopes. These events are particularly important along major transportation routes, including the Karakoram Highway and other valley roads that connect remote communities with markets, health facilities, and educational institutions (Ismail. 2025).

The consequences of landslides and rockfalls extend beyond physical damage and constitute an important non-traditional security and human-security concern in Gilgit-Baltistan. Landslides can block roads, damage bridges, houses, agricultural land, irrigation channels, and electricity infrastructure, while prolonged road closures can isolate communities and disrupt the movement of food, medicine, and other essential goods. Recurrent slope failures can also increase economic losses, restrict mobility, and contribute to livelihood insecurity and displacement. Therefore, effective management requires hazard mapping, slope monitoring, early-warning systems, resilient road infrastructure, controlled construction, community preparedness, and coordinated disaster-risk management.

Water Insecurity in Gilgit-Baltistan

Water insecurity is an emerging non-traditional security challenge in Gilgit-Baltistan, where communities depend heavily on glaciers, seasonal snowmelt, springs, rivers, and other mountain water resources for drinking water, agriculture, livestock, and hydropower. Climate change is altering the timing and availability of these water sources through changing precipitation patterns, accelerated glacier and snow melt, and increasing temperatures. Although Gilgit-Baltistan contains extensive freshwater resources in the form of glaciers and snow, geographical remoteness, inadequate water infrastructure, seasonal variability, and climate-related hazards can limit reliable access to safe and sufficient water for local communities (Aslam, 2025).

The consequences of water insecurity extend beyond shortages of drinking water and can affect food security, public health, agriculture, livelihoods, and human security. Changes in water availability can reduce agricultural productivity and place additional pressure on households that depend on farming and livestock. At the same time, floods, GLOFs, landslides, and sedimentation can damage water-supply systems and contaminate existing sources. Addressing water insecurity therefore requires climate-resilient water infrastructure, improved watershed management, efficient irrigation systems, protection of springs and other local water sources, water conservation, and effective monitoring and disaster preparedness. These measures can strengthen the long-term resilience of communities facing increasing climate-related pressures. (Fatima 2025).

Agricultural Vulnerability

Agricultural vulnerability is an important dimension of climate-related insecurity in Gilgit-Baltistan, where a large proportion of rural households depend on agriculture, horticulture, livestock, and related activities for their livelihoods. The region's agriculture is highly sensitive to changes in temperature, precipitation, water availability, and the timing of snow and glacier melt. Increasing temperatures, irregular rainfall, drought-like conditions, flash floods, GLOFs, landslides, and other extreme weather events can damage crops, orchards, irrigation channels, and agricultural land. These pressures are particularly significant for small-scale farmers who have limited financial resources and fewer opportunities to recover quickly from climate-related losses.

Climate-induced agricultural vulnerability can have wider consequences for food security, household income, livelihoods, and human security. Damage to crops and fruit orchards can

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reduce agricultural production and household earnings, while disruptions to irrigation systems can further constrain cultivation. Extreme weather events may also destroy stored food, livestock, agricultural infrastructure, and local market access, increasing economic pressure on rural communities. Strengthening agricultural resilience therefore requires climate-smart farming practices, improved irrigation and water-management systems, crop diversification, early-warning mechanisms, disaster-resilient infrastructure, access to agricultural insurance or financial support, and greater institutional assistance for vulnerable farming communities. Mountain ecosystems are highly sensitive to climatic changes. Changes in temperature and precipitation can affect biodiversity, forests, rangelands, wildlife habitats, and ecosystem services. (Taylor 2025).

Socio-economic Impacts

Climate change can affect nearly every major sector of GB's economy. Agricultural losses can reduce household income and food availability. Damage to roads can interrupt markets and increase transportation costs. Tourism can be disrupted by landslides, floods, extreme weather, and infrastructure damage. The Small businesses are particularly vulnerable because they often lack financial reserves and insurance mechanisms. When disasters destroy shops, livestock, orchards, or agricultural land, households may have limited capacity to recover. The Climate change can also increase public expenditure. Governments must allocate resources for emergency relief, reconstruction, infrastructure repair, evacuation, and rehabilitation. Repeated disasters can divert resources away from education, health, and long-term development. (Ahmed 2023).

Climate Change and Water Security

Water security is one of the most important dimensions of climate security in GB. The region's glaciers and snowfields contribute significantly to river systems that support downstream communities and agricultural production. Climate change creates a complex situation. Accelerated melting may increase water availability in the short term while potentially reducing long-term glacier reserves. Changes in snowfall and rainfall can further modify seasonal water availability. Water insecurity can also affect agriculture, hydropower, domestic consumption, and ecosystems. Therefore, climate adaptation must include improved water storage, watershed management, efficient irrigation, conservation, and scientific monitoring. (Allan 2026).

Climate Change and Food Security

The Food security is closely linked to climate conditions in GB. Agricultural communities depend on predictable water availability and stable seasonal conditions. Climate-related disasters can destroy crops and orchards while disrupting livestock systems. The development of climate-smart agriculture is therefore essential. Improved irrigation, drought-resistant crops, modern agricultural practices, protected cultivation, improved storage facilities, and agricultural extension services can strengthen food resilience. The Infrastructure represents one of the most vulnerable sectors in GB. Roads, bridges, electricity networks, communication systems, irrigation channels, schools, health facilities, and residential structures can be damaged by floods and landslides. The Karakoram Highway is particularly important because it connects communities and facilitates trade, tourism, transportation, and regional connectivity. Climate-related disruption can have consequences beyond individual communities by affecting national and regional economic activity. The Future infrastructure planning should therefore incorporate climate-risk assessments and resilient engineering standards (Jain 2024).

Climate Change and Tourism

Tourism is an important source of employment and income in GB. The region's mountains, glaciers, valleys, lakes, and cultural heritage attract

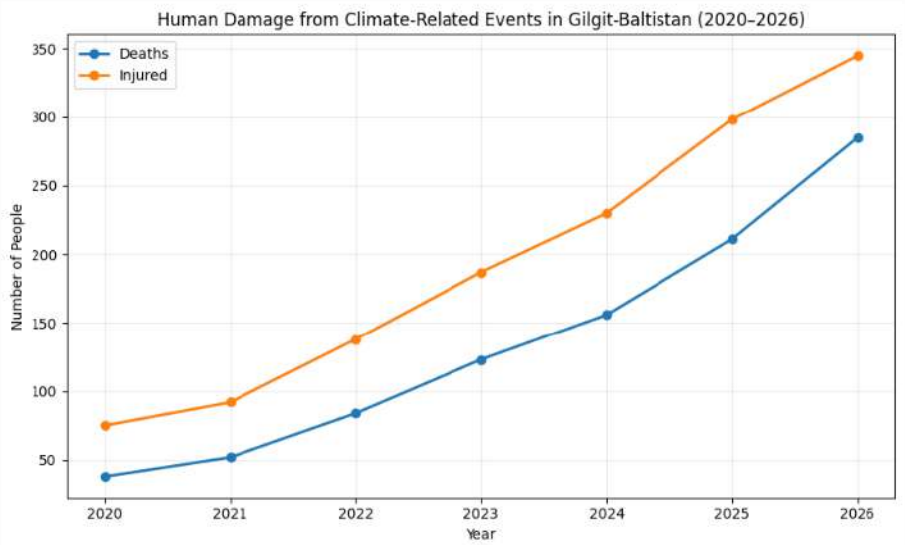
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domestic and international visitors. However, climate change creates new risks for tourism. Landslides, floods, road closures, changing landscapes, water shortages, and extreme weather can reduce tourist accessibility and increase safety risks. At the same time, climate-conscious tourism can contribute to adaptation through ecosystem protection, waste management, responsible construction, and community-based tourism. Climate change can contribute to social instability when disasters produce competition over scarce resources, unemployment, displacement, or unequal access to assistance. The impacts are unlikely to be distributed equally. Poor households, remote communities, farmers, women, children, elderly people, and persons with limited access to services may face greater vulnerability. The Climate justice therefore needs to become an important component of climate-security policy in GB. (Gössling 2009).
Several institutional challenges affect climate resilience in GB.

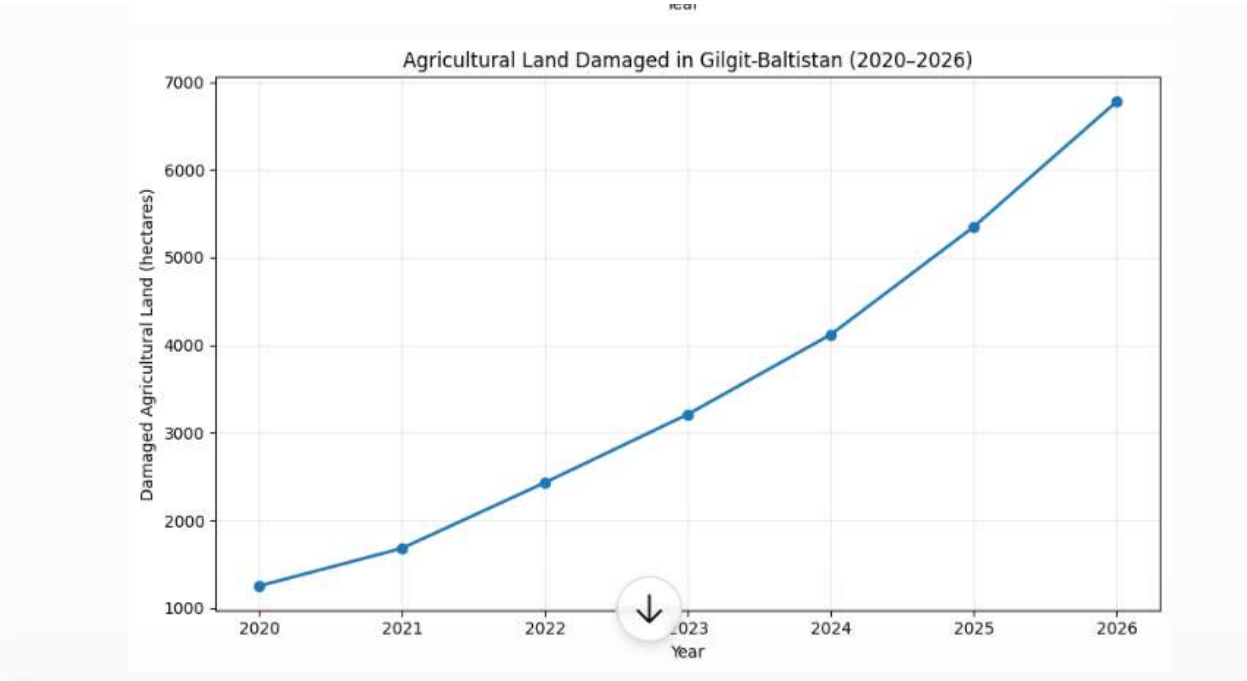
- First, climate governance involves multiple institutions, including government departments, disaster-management authorities, local administrations, environmental agencies, and development organizations. Limited coordination can reduce policy effectiveness.
- Second, scientific and technical capacity remains insufficient for comprehensive glacier, water, weather, and hazard monitoring.
- Third, remote communities may have limited access to emergency services and communication networks.
- Fourth, disaster responses can become reactive rather than preventive. Greater emphasis is needed on risk reduction, preparedness, and adaptation before disasters occur.
- Fifth, local communities are not always sufficiently integrated into climate planning despite possessing valuable indigenous knowledge concerning mountain ecosystems, weather patterns, agriculture, and disaster risks. (Ashraf 2026).

2020–2026 graph showing human and agricultural damage in Gilgit-Baltistan.



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Overview of the Graphs

The graphs illustrate the increasing human and agricultural damage associated with climate-related events in Gilgit-Baltistan from 2020 to 2026. The first graph shows a general upward trend in reported deaths and injuries, indicating increasing human vulnerability to floods, landslides, GLOFs, and other climate-related hazards. The second graph demonstrates a rising trend in agricultural land damage, suggesting growing pressure on farming communities, livelihoods, and food security.

Overall, the graphs indicate that climate change is creating interconnected human and socioeconomic risks in Gilgit-Baltistan**.** Increasing damage to people and agricultural land can contribute to livelihood insecurity, poverty, food insecurity, displacement, and reduced community resilience. However, the figures used in the graphs are illustrative and should be replaced with verified government or scientific data before being presented as empirical findings.

Policy Responses

Strengthening Early-Warning Systems

GB should expand community-based early-warning systems for GLOFs, flash floods, landslides, and extreme weather. Warning mechanisms should connect scientific monitoring with local communication networks and clearly defined evacuation procedures.

Climate-Resilient Infrastructure

Roads, bridges, hydropower facilities, schools, hospitals, irrigation channels, and communication systems should be designed according to climate-risk assessments. Infrastructure planning should account for future rather than historical climatic conditions.

Glacier and Water Monitoring

Investment in remote sensing, satellite technology, hydrological monitoring, glacier observation, and weather stations should be increased. Universities and research institutions should be encouraged to develop long-term climate datasets for GB. (Zahra 2025). Local communities should be treated as active partners rather than passive recipients of

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disaster assistance. Community disaster committees, evacuation training, emergency drills, and local volunteer networks can significantly strengthen resilience.

Climate-Smart Agriculture and Ecosystem Restoration

Farmers should receive technical support for efficient irrigation, drought-resistant crops, improved orchards, water conservation, protected cultivation, and climate-resilient livestock practices. The Forest protection, watershed restoration, rangeland management, wetland conservation, and biodiversity protection can reduce environmental vulnerability while strengthening ecosystem services. (Ahmad 2026).

Climate-Resilient Tourism

Tourism policies should integrate climate-risk assessments, sustainable construction, environmental protection, waste management, emergency preparedness, and community participation. A dedicated climate-security coordination mechanism should connect environmental, disaster-management, water, agriculture, tourism, infrastructure, and local-government institutions. The GB requires greater access to national and international climate-finance mechanisms. Financial resources should prioritize adaptation because many vulnerable communities have limited capacity to finance climate resilience independently. The Universities and research centers should establish specialized climate-security research programs. Local students and researchers can contribute to vulnerability assessments, climate monitoring, disaster mapping, and community adaptation planning. (Khalil 2025)

Findings

The study identifies five major findings.

- Climate change has evolved beyond an environmental issue and represents a multidimensional non-traditional security challenge for GB.
- Glacier-related hazards, floods, landslides, water insecurity, and ecosystem degradation have interconnected effects on human security.
- Socio-economic vulnerability significantly increases the consequences of climate disasters. Communities with limited resources have fewer opportunities to recover from environmental shocks.
- Infrastructure vulnerability is a major climate-security concern because road closures, damaged bridges, electricity disruptions, and communication failures can isolate communities and disrupt economic activity.
- Existing responses require a stronger preventive and integrated approach. Early-warning systems, community participation, scientific monitoring, climate-resilient infrastructure, and coordinated governance are essential for reducing future risks.

Policy Recommendations

- Develop a comprehensive Climate Security Policy for Gilgit-Baltistan integrating environmental, human-security, disaster-management, and development priorities.
- Expand GLOF and flood early-warning systems and establish reliable community-level evacuation mechanisms.
- Climate-proof critical infrastructure, particularly roads, bridges, hydropower facilities, irrigation systems, schools, and health facilities.
- Establish a GB Climate Research and Monitoring Network connecting universities, government departments, meteorological institutions, and local communities.
- Strengthen community-based adaptation by incorporating local knowledge into

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disaster-risk reduction and climate planning.

- Improve water governance through watershed protection, efficient irrigation, water conservation, and small-scale storage systems.
- Promote climate-smart agriculture to protect food security and rural livelihoods.
- Develop climate-resilient tourism policies that protect both visitors and fragile mountain ecosystems.
- Increase access to climate finance for adaptation, disaster preparedness, ecosystem restoration, and resilient infrastructure.
- Integrate climate risk into all major development projects, including transportation, energy, tourism, and CPEC-related infrastructure.

Conclusion

Climate change has emerged as a major non-traditional security challenge in Gilgit-Baltistan, with consequences extending beyond environmental degradation to human security, livelihoods, infrastructure, food security, water availability, and socioeconomic stability. The region's mountainous geography, extensive glaciers, fragile ecosystems, and dependence on climate-sensitive economic activities make local communities particularly vulnerable to changing climatic conditions. Increasing temperatures, changing precipitation patterns, glacier retreat, and extreme weather events have intensified existing environmental pressures and created new security risks for communities across the region.

Glacial Lake Outburst Floods (GLOFs) represent one of the most serious climate-related hazards in Gilgit-Baltistan. The expansion and instability of glacial lakes can expose downstream communities to sudden and destructive floods. GLOFs can damage houses, agricultural land, roads, bridges, irrigation channels, electricity infrastructure, and communication networks. Beyond their immediate physical effects, these events can disrupt livelihoods, displace communities, and reduce access to essential services. Consequently, GLOFs demonstrate how environmental changes can directly affect human security and community resilience.

Flash floods have also become a significant threat to communities and infrastructure throughout Gilgit-Baltistan. Intense rainfall, cloudbursts, rapid snow and glacier melt, and other hydrometeorological processes can generate sudden floods with limited time for communities to respond. Such events can damage transportation networks, agricultural land, homes, bridges, and public infrastructure. Repeated flooding can also interrupt economic activities and restrict the movement of people and essential goods. The experience of recent years demonstrates the importance of strengthening early-warning mechanisms and disaster preparedness at both institutional and community levels.

Similarly, landslides and rockfalls pose substantial risks because of the region's steep slopes, unstable geological formations, and extensive road networks located along mountain valleys. Climate-related changes in precipitation, temperature, snowmelt, and freeze–thaw processes can contribute to slope instability. Landslides and rockfalls can block roads, isolate communities, damage infrastructure, and disrupt access to markets, education, healthcare, and other essential services. These hazards therefore have implications not only for environmental safety but also for mobility, economic security, and the overall resilience of mountain communities.

Water insecurity constitutes another important dimension of climate-related vulnerability in Gilgit-Baltistan. Despite the region's extensive glaciers, snowfields, rivers, and springs, climate change can alter the seasonal availability and distribution of water resources. Changes in snow and glacier melt, precipitation patterns, and extreme weather events can create uncertainty in water supplies for households, agriculture,

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livestock, and hydropower generation. Damage to water-supply and irrigation infrastructure during floods and landslides can further increase vulnerability. Sustainable water governance and climate-resilient infrastructure are therefore essential for ensuring long-term water security.

The region's agricultural sector is particularly vulnerable because farming and horticulture depend heavily on predictable water availability and suitable climatic conditions. Changes in temperature, precipitation, and the timing of snowmelt can affect crop production, orchards, livestock, and irrigation systems. At the same time, floods, GLOFs, landslides, and other extreme events can destroy agricultural land and infrastructure within a short period. Agricultural vulnerability can subsequently contribute to food insecurity, declining household income, and livelihood pressures, particularly among small-scale farmers with limited resources for recovery.

The impacts of climate change also demonstrate the interconnected nature of human security in Gilgit-Baltistan. Environmental hazards can simultaneously affect economic security, food security, water security, health, livelihood security, and physical safety. For example, the destruction of a road by a flood or landslide may restrict access to markets and healthcare, while agricultural losses may reduce household income and food availability. This interconnectedness indicates that climate change should not be treated solely as an environmental issue; rather, it requires an integrated security and development approach.

Effective responses require stronger institutional capacity and climate governance at the regional and national levels. Disaster-management institutions need improved technical capacity, hazard monitoring, early-warning systems, emergency communication, evacuation planning, and coordination with local communities. Investments in resilient roads, bridges, irrigation systems, water-supply networks, and other critical infrastructure can reduce exposure to climate-related hazards. At the same time, local knowledge and community participation should be incorporated into disaster-risk reduction and climate-adaptation planning because local communities possess valuable knowledge about environmental changes and recurring hazards.

Climate adaptation in Gilgit-Baltistan should also be integrated with sustainable development and livelihood protection. Climate-smart agriculture, efficient irrigation, watershed conservation, ecosystem restoration, diversified livelihoods, and improved disaster preparedness can strengthen community resilience. Greater investment in scientific research, glacier and glacial-lake monitoring, climate data collection, and risk mapping can support evidence-based policymaking. Furthermore, collaboration among federal and regional authorities, academic institutions, development organizations, and local communities is necessary to address the multidimensional nature of climate-related security risks.

In conclusion, climate change is transforming the security landscape of Gilgit-Baltistan by intensifying environmental hazards and creating interconnected challenges for human safety, livelihoods, infrastructure, water resources, and food security. GLOFs, flash floods, landslides, rockfalls, water insecurity, and agricultural vulnerability demonstrate the multiple pathways through which climate change can affect the region. Addressing these challenges requires a shift from a predominantly reactive disaster-response approach toward anticipatory, preventive, and community-centered climate governance. Strengthening early-warning systems, resilient infrastructure, environmental monitoring, sustainable resource management, and local institutional capacity can reduce vulnerability and improve resilience. A comprehensive climate-security framework that connects environmental protection with human security and sustainable development is therefore essential for safeguarding the communities and socioeconomic future of Gilgit-Baltistan.

Climate change has become a major non-traditional security challenge in Gilgit-Baltistan.

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The region's unique geography, extensive glaciers, fragile ecosystems, dispersed settlements, and dependence on climate-sensitive livelihoods make it highly vulnerable to environmental change. Glacier melting, GLOFs, floods, landslides, water insecurity, agricultural disruption, ecosystem degradation, and climate-induced displacement can generate interconnected security risks.

The significance of climate change in GB extends beyond environmental degradation. Its consequences affect human security, economic stability, food and water security, infrastructure, tourism, public health, and social resilience. Climate-related disasters can also increase pressure on government institutions and divert public resources toward emergency response and reconstruction. A narrow disaster-response approach is therefore insufficient. Climate security requires prevention, preparedness, adaptation, scientific research, resilient infrastructure, community participation, and effective governance. Government institutions should work closely with local communities, universities, civil society, and development partners to build long-term resilience.

Ultimately, protecting GB from climate-related security risks requires a shift from reactive disaster management toward proactive climate-security governance. By integrating climate risk into development planning and strengthening the adaptive capacity of vulnerable communities, Gilgit-Baltistan can better protect its people, ecosystems, infrastructure, and future development.

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