IFRC Global Disaster Preparedness Center

RESEARCH PAPER

Exploring Climate Resilience in a Low-Middle Income Country:

The Impact of Socio-Economic Incentives on Informal Workers in Khyber Pakhtunkhwa, Pakistan

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2025

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Abstract

Climate change disproportionately impacts informal sector workers, who face precarious incomes, limited assets, and exclusion from formal social protection systems. This study examines how socio-economic incentives, particularly one-time cash grants and the Benazir Income Support Program (BISP), contribute to the climate resilience of informal sector workers in Khyber Pakhtunkhwa, Pakistan. A qualitative phenomenological design was used to capture lived experiences across three climatic zones: northern, central, and southern. Data was collected through thirty in-depth interviews with informal sector workers and six focus group discussions with institutional stakeholders.

Findings show that while cash transfers provided short-term relief for food, rent, and healthcare, their fixed amounts and rigid schedules were insufficient to address recurrent and long-term climate shocks. Barriers such as digital inaccessibility, bureaucratic hurdles, and gendered restrictions further constrained access, particularly for rural women. Despite these challenges, informal sector workers relied on social networks, flexible routines, and low-cost innovations to manage crises.

The study concludes that current programs primarily build absorptive rather than transformative resilience. It calls for climate-sensitive social safety nets that are climate-smart, inclusive, and adaptive social protection systems to strengthen the long-term resilience of informal sector workers.

Keywords: Climate resilience; Social Safety Nets; Informal Sector workers; Benazir Income Support Program, Pakistan

This work was part of a multi-country research initiative led by the Global Disaster Preparedness Center of the American Red Cross.

1. Introduction

Climate change constitutes a paramount challenge of the 21st century, threatening livelihoods, health, and socio-economic stability worldwide, with particularly severe consequences for low- and middle-income countries (LMICs) (Mazumder & Hossain, 2024; Romanello et al., 2023; Sharpe & Davison, 2021). Altered weather patterns and the rise in extreme events undermine agricultural production, cause crop failures, and increase food insecurity for millions (Mirzabaev et al., 2023). Vulnerable populations are disproportionately affected, with climate impacts exacerbating poverty and inequality (Adom, 2024). The Intergovernmental Panel on Climate Change (IPCC) report 2023, highlighted the heightened risks faced by developing countries, driven by financial constraints, reliance on climate-sensitive industries such as agriculture, and insufficient infrastructure to withstand severe shocks (Lee & Calvin, 2023).

Pakistan exemplifies these vulnerabilities, experiencing more frequent and severe floods, droughts, and heatwaves that compound existing socio-economic challenges (Adnan et al., 2024). The 2010 floods affected up to 20 million people, caused 1,800 deaths, destroyed over 400 healthcare facilities, and inflicted damages worth $10 billion (Kirsch et al., 2012). They also worsened food insecurity, affecting an estimated 30% of the population and leaving an additional 5 million people undernourished (Kirsch et al., 2012). More recently, the 2022 floods impacted more than 33 million people, caused 1,700 deaths, led to $2.3 billion in agricultural losses, and generated total economic damages of nearly $30 billion (Knippenberg et al., 2024; Shehzad, 2023). Water-related diarrheal diseases remain a leading cause of infant mortality, while prolonged droughts affect more than half the country, leaving 30% of the population food and water insecure (Ahmad et al., 2022; Q.-Z. Chaudhry, 2017). Health and economic impacts are further illustrated by the 2015 Karachi heatwave, which caused over 1,200 deaths (Hanif, 2017). Looking ahead, average temperatures are projected to rise by 2–4°C by 2050, increasing the risk of prolonged heatwaves and threatening public health and economic stability (Somani, 2023). The Global Climate Risk Index (2023) ranked Pakistan fifth among the most severely affected countries between 2000 and 2021, underscoring the urgent need for effective climate adaptation (Adnan et al., 2024; I. Jan et al., 2021).

Khyber Pakhtunkhwa (KP) in Pakistan is highly vulnerable to climate change due to its diverse geography and socio-economic conditions (Q.-Z. Chaudhry, 2017). The province spans multiple climatic zones, ranging from temperate northern areas to arid southern districts, resulting in varied vulnerabilities (Babar et al., 2015). Melting glaciers increase flooding and water scarcity downstream, while deforestation and soil erosion contribute to landslides (Mumtaz, 2018). Erratic rainfall undermines agriculture, leading to both droughts and destructive flooding, with serious consequences for food security and rural livelihoods

(Babar et al., 2015). These risks aggravate poverty, displace communities, and stretch already limited adaptation resources.

The province's economy is heavily dependent on the informal sector, which constitutes around 40% of provincial employment, including street vending, construction, and agriculture (Planning & Development, 2023). Informal workers are among the most climate-vulnerable groups, as they lack stable incomes, secure employment, and access to safety nets (Shahid et al., 2022). Their exclusion from unemployment benefits, health insurance, and other social protection mechanisms leaves them especially exposed to climate shocks (Asif Javed et al., 2021).

On a global scale, social protection is a comprehensive set of public policies and programs designed to alleviate poverty and reduce vulnerability by providing income support, access to essential services, and safeguards against livelihood shocks (Johnson & Krishnamurthy, 2010; Silchenko & Murray, 2023). It has become an integral component of efforts toward climate adaptation and sustainable development. Internationally, frameworks such as the Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction recognize social protection as a vital mechanism for enhancing resilience and promoting equity (Aitsi-Selmi & Murray, 2016; Johnson & Krishnamurthy, 2010).

In Pakistan, several social protection initiatives reflecting these global priorities have been launched to address these vulnerabilities (Mahnaz Hassan, 2015). The Benazir Income Support Program (BISP) is the country's largest cash transfer scheme, supporting 5.6 million families by 2021, nearly 40% of those below the poverty line (Cheema et al., 2016). Beneficiaries receive monthly cash transfers of PKR 2,000 (approximately $12), which improve access to food, healthcare, and education for nearly two-thirds of households (Cheema et al., 2016). Similarly, the program provided one-time cash transfers of PKR 25,000 (approximately $140) to over 250,000 affected households (Knippenberg et al., 2024). Despite the expansion of such programs, little is known about how social protection contributes to climate resilience, especially among informal workers in KP.

By exploring this intersection, the study seeks to generate novel insights into how socio-economic incentives influence climate resilience among informal sector workers in KP. Although locally focused, the findings will provide empirical evidence on workers' perspectives regarding one-time cash grants and the Benazir Income Support Program (BISP), highlighting barriers and facilitators in accessing these incentives. By incorporating the voices of informal workers and stakeholders, the study aims to offer practical recommendations for policymakers to strengthen the role of social protection program in building climate resilience.

2. Literature Review

As a critical global challenge of the 21st century, climate change has demonstrated wide-ranging effects on both ecosystems and human well-being (Malhi et al., 2020; Rocque et al., 2021). Climate change has both direct and indirect effects on public health, economic stability, food security, and human mobility (Mirzabaev et al., 2023). The direct consequences of climate change include a heightened frequency of extreme weather events such as floods, droughts, heatwaves, rising sea levels, and alterations in disease patterns, all of which pose threats to human health, livelihoods, and ecosystems (Bell et al., 2018; Bolan et al., 2024). Indirectly, climate change intensifies food and water insecurity, compels migration, disrupts healthcare systems, and exacerbates existing social and economic inequalities, especially within vulnerable communities (Parry et al., 2019). A significant rise in vector-borne, water-borne, food-borne, respiratory, and heat-related diseases is expected to be driven by changes in ecosystems, rising temperatures, and intensified environmental and social vulnerabilities (Bianco et al., 2024; Zhao et al., 2022). While climate change is a global phenomenon, its consequences are not evenly distributed and are felt most acutely by countries with limited adaptive capacity (Levy & Patz, 2015).

Low- and middle-income countries (LMICs) bear a disproportionate burden, as constrained resources and inadequate infrastructure exacerbate climate-related challenges such as health risks, displacement, and economic instability (Naser et al., 2024). LMICs comprise over 80% of the global population and contribute minimally to global emissions (Bianco et al., 2024), have experienced a disproportionate share of climate-related impacts, including an estimated economic loss of US$ 2.56 trillion (in purchasing power parities), approximately 475,000 deaths linked over 11,000 extreme weather events globally between 2000 and 2019 (Eckstein et al., 2021). Furthermore, evidence indicates that climate change exacerbates pre-existing geographic and socioeconomic disparities, particularly those related to gender, disproportionately impacting women, especially those who are pregnant or breastfeeding, in addition to informal workers and rural populations (Anjum & Aziz, 2025). Between 2026 and 2050, climate-related health incidents are projected to range from 4.1 to 5.2 billion, potentially resulting in 14.5 to 15.6 million deaths (World Bank Group, 2024).

2.1. Defining Climate Resilience: From Absorption to Transformation

In light of the increasing threats associated with climate change, the idea of climate resilience has become more prominent in the fields of development, humanitarian efforts, and environmental studies (Bray et al., 2023; Motevalli et al., 2023). Traditionally, resilience refers to the capacity to revert to a condition akin to that which existed prior to

a disruption. In the realm of climate recovery, resilience is characterized as the capability of an individual, community, or collective to bounce back from a disaster event (Mochizuki et al., 2018; Walsh-Dilley & Wolford, 2015). However, this "bouncing back" framing rooted in engineering and ecological notions of equilibrium has been increasingly contested within disaster resilience scholarship, as it risks reinforcing pre-existing vulnerabilities rather than fostering transformation (Aldunce et al., 2014). Early work in disaster risk management showed that practitioners and researchers conceptualized resilience in divergent ways, producing differing policy and operational implications (Aldunce et al., 2014). Consequently, contemporary frameworks now emphasize that resilience should extend beyond recovery to include learning, adaptation, and transformation that reduce structural inequities and long-term vulnerability (Bray et al., 2023; Wilson et al., 2020).

Resilience is now understood as the ability of ecological, social, institutional, and infrastructural systems to withstand disturbances, adapt to stress and change, and continue maintaining critical functions, structures, and feedback mechanisms (Solomon et al., 2007). Notably, climate resilience transcends merely returning to pre-crisis conditions; it encompasses learning, adaptation, and transformation aimed at diminishing long-term vulnerability (Bray et al., 2023). Evidence suggests that strengthening the capacity of individuals, households, communities, and systems to adapt, recover, and thrive through adaptation, mitigation, and vulnerability reduction (Birchall et al., 2025; Rogers et al., 2023).

Research identifies three interconnected components of resilience: absorptive capacity, referring to the ability to endure and absorb shocks without major disruption; adaptive capacity, which involves making incremental adjustments in response to changing conditions; and transformative capacity, the ability to fundamentally reshape systems and structures to address underlying vulnerabilities (Bray et al., 2023). In LMICs, fostering resilience transcends being solely a technical or environmental endeavor; it necessitates comprehensive transformations in governance, service provision, and inclusive development (Aziz & Anjum, 2024). Scholars contend that resilience is fundamentally connected to equity, justice, and redistribution (Amorim-Maia et al., 2022; Matin et al., 2018). If power dynamics and social inequalities are overlooked, marginalized communities may be further disadvantaged under the guise of adaptation (Fei & Islam, 2024). Growing evidence underscores that genuine resilience requires transformative governance and societal change (Wilson et al., 2020). In this regard, socio-economic resilience in LMICs emerging as a key determinant of communities' ability to cope with and recover from climate impacts (Codyre et al., 2025; Middelanis et al., 2025).

2.2. Social Protection as a Tool for Climate Resilience

Social protection comprises a set of institutional mechanisms aimed at safeguarding individuals and households from poverty, livelihood disruptions, and adverse socio-economic or environmental shocks (Costella et al., 2023). It involves strategies to strengthen labor markets, reduce exposure to economic and social vulnerabilities, and enhance the capacity of people to withstand and recover from financial shocks (Costella et al., 2023). Broadly, formal social protection systems encompass four principal categories: social assistance, social insurance, labor market interventions, and universal schemes (Thimmappa et al., 2021). Among the various forms of social protection, social assistance has exhibited the widest reach and contextual relevance, especially in settings marked by persistent poverty, constrained access to formal labor markets, and elevated vulnerability to climate-related risks (Banerjee et al., 2024).

Social assistance programs play a pivotal role in alleviating poverty, enhancing household welfare, and building climate change adaptation to various shocks (Tenzing, 2020). In Pakistan, the Benazir Income Support Program (BISP), the largest social assistance initiative in South Asia, while not explicitly designed for climate adaptation, has nonetheless provided short-term protection against income loss and contributed to long-term gains in women's empowerment and child health outcomes (Ambler & De Brauw, 2017; Heaton et al., 2024; Sarfraz et al., 2022). An expanding body of evidence demonstrates that social assistance measures, such as cash transfers (conditional and unconditional), food aid, and school feeding programs, play a critical role in protecting vulnerable households from climate-related shocks. (Agrawal et al., 2020). In the Sahel region, multi-year conditional cash transfer programs have supported household resilience by stabilizing consumption, reducing food insecurity, and limiting the need for distress asset sales during drought periods, while also enabling modest savings and income smoothing (Premand & Stoeffler, 2022). In Ethiopia, unconditional transfers under the Productive Safety Net Program (PSNP), particularly through the Permanent Direct Support mechanism and early action drought response, have significantly improved food security, reduced reliance on negative coping strategies, and supported recovery among pastoralist communities (Berhane et al., 2015). Similarly, In Kenya, the Hunger Safety Net Program and Inua Jamii unconditional cash transfer programs have been empirically associated with measurable gains in household food security during droughts, including estimated 2.6–3.4% improvements in food consumption scores in arid regions (Jensen et al., 2017), along with documented increases in nutrient intake and reduced welfare losses among recipient households (Aizawa, 2020; Dietrich & Schmerzeck, 2019).

Although social assistance forms the cornerstone of climate-responsive protection in many countries, other instruments within the social protection architecture also contribute

meaningfully to resilience (Ulrichs et al., 2019). Social insurance, particularly index-based weather insurance schemes, have proven effective in countries such as Kenya and Ethiopia by protecting farmers from rainfall-related shocks, preventing asset losses, stabilizing food consumption, and maintaining agricultural productivity (Muleke et al., 2025). Labor market programs such as India's Mahatma Gandhi National Rural Employment Guarantee Act have been used to provide seasonal income while supporting ecological restoration and infrastructure development, thereby enhancing adaptive capacity (Lengefeld et al., 2022). Although universal schemes such as South Africa's Child Support Grant are often viewed primarily as social welfare interventions, emerging evidence suggests that, when combined with complementary instruments such as pensions, insurance, and labor programs, they play a critical role in strengthening resilience to slow-onset climate risks by supporting consumption smoothing, improving nutrition, and enhancing household stability (Kumaraswamy & Washington, 2024; Patel et al., 2015; Schatz et al., 2012).

Recent empirical evidence suggests that well-designed social protection programs, particularly social assistance, offer all three core dimensions of climate resilience: absorptive, adaptive, and transformative capacities (Ulrichs et al., 2019). For instance, the Ethiopia's Productive Safety Net Program (PSNP) demonstrates absorptive capacity by reducing distress asset sales during droughts and enabling food consumption smoothing (Berhane et al., 2015). India's Mahatma Gandhi National Rural Employment Guarantee Act, reflects adaptive capacity, as it has been linked to improved soil fertility and water conservation, which contribute to increased agricultural productivity and reduced rural-to-urban migration (Angom & Viswanathan, 2022; Yadav et al., 2024). For instance, Ecuador's Bono de Desarrollo Humano illustrates transformative capacity by promoting women's agency and social inclusion, addressing structural inequalities and supporting long-term resilience (Molyneux & Thomson, 2011). As the risks associated with global climate change become more severe, it is crucial to expand and enhance social protection, especially social assistance, to guarantee both equitable and sustainable resilience in the short and long term (Ulrichs et al., 2019). Presently, these systems have broad coverage, reaching approximately 2.5 billion people in 120 countries, including about 650 million individuals from the poorest 20 percent of the population (Banerjee et al., 2024).

2.3. Pakistan's Climate Fragility and Adaptive Infrastructure

Pakistan, while contributing less than 1% of global emissions, is among the most climate-vulnerable countries, with floods, heatwaves, glacial melt, and droughts causing nearly 10,000 deaths and over USD 3.8 billion in losses between 1998 and 2018 (Ajani & van der Geest, 2021; Munir, 2025; Somani, 2023). The 2022 mega-floods, driven by record monsoon rains and glacial melt, affected over 33 million people, submerged a third of the

country, and caused economic losses exceeding USD 30 billion, surpassing the devastation of the 2010 floods. A recent post-disaster study estimated that these floods pushed an additional 9.1 million people into poverty, with major impacts on agriculture, shelter, water, and health systems (Knippenberg et al., 2024; Zaidi & Memon, 2023). The geography of Pakistan, which includes glacial mountains in the northern region, flood-prone river basins in the central area, and arid plains in the southern part, heightens its vulnerability to a variety of distinct climate risks (M. A. Hussain et al., 2022). Over 3,000 glacial lakes have formed in Gilgit-Baltistan and Khyber Pakhtunkhwa, with at least 33 at risk of glacial lake outburst floods (Aslam et al., 2022). Simultaneously, southern districts in the province of Sindh, such as Tharparkar, experience recurrent droughts, contributing to widespread food insecurity and child stunting rates exceeding 45% (Memon et al., 2025). In the southern province of Baluchistan, particularly in drought-prone districts such as Chagai, stunting rates are alarmingly high, ranging from 27% among adolescents to 81% among children under the age of five (N. G. Nawaz & Azhar, 2025).

The government has formulated several climate and disaster governance frameworks, including the National Climate Change Policy (2012, revised 2021), the Disaster Risk Management Framework, and the ongoing revisions of the National Adaptation Plan (NAP) (A. Khan et al., 2024). However, implementation remains hindered by weak institutional capacity, inadequate funding, and fragmented inter-agency coordination (Kanwal et al., 2025; Mumtaz, 2023). This institutional weakness manifests in several ways: overlapping mandates among the Ministry of Climate Change, the National Disaster Management Authority (NDMA), and provincial departments lead to fragmented decision-making; limited technical expertise and inadequate data systems constrain evidence-based planning; and insufficient financial allocations historically below 0.004% of GDP, significantly limit local implementation, a figure far lower than the estimated regional adaptation needs of approximately 1.5–3.0% of GDP (Q. uz-zaman Chaudhry et al., 2015).

Low-income households and informal workers, who make up over 70% of Pakistan's labor force, are among the most severely affected due to limited access to healthcare, insurance, and government support (Austin et al., 2025; Kishwar et al., 2023). Female-headed households, migrants, and people with disabilities experience intersecting vulnerabilities during climate shocks, including displacement, income loss, and psychosocial stress (Ullah et al., 2024). To mitigate social inequalities, Pakistan has made significant investments in social protection infrastructure, especially following the launch of the Benazir Income Support Program (BISP) in 2008 (Pasha et al., 2018). BISP provides unconditional cash transfers to over 9.3 million low-income women, promoting financial inclusion and household stability (Hasan & Masood, 2024). Studies indicate that BISP has positively influenced women's decision-making autonomy, food security, and child nutrition, which

are key indicators of household resilience (Fenn et al., 2017; Heaton et al., 2024; G. Mustafa et al., 2019; Sarfraz et al., 2022).

While Pakistan has taken steps to improve its climate governance through the National Climate Change Policy (2012; revised 2021), the National Disaster Risk Management Framework, and participation in global forums, implementation remains constrained by political instability, weak institutional capacity, and low levels of domestic financing (Rasul, 2022). During crises, Pakistan has demonstrated the capacity to rapidly scale up social assistance. Under BISP, the Ehsaas Emergency Cash Program disbursed USD 1.2 billion to approximately 14 million households within weeks during the COVID-19 pandemic, utilizing digital verification and mobile money platforms (Davies et al., 2023). Similarly, during the 2022 floods, the government provided PKR 25,000 per household to over 2.8 million families using BISP's National Socio-Economic Registry, enhancing timeliness and coverage (Zahidullah et al., 2022). However, its potential role in enhancing climate adaptation and resilience remains largely unexplored in vulnerable groups (Bowen et al., 2020), particularly informal sector workers.

2.4. Climate Vulnerability and Informal Sector Workers in Khyber Pakhtunkhwa

Khyber Pakhtunkhwa (KP), situated in the northwestern region of Pakistan, is recognized as one of the most climatically and geographically varied provinces in the nation (Bibi et al., 2025). KP has an estimated population of approximately 40.85 million, with 51.02% male and 48.97% female (Nouman et al., 2025). The population remains largely rural, with 84.99% living in rural areas and only 15.01% in urban centers (Nouman et al., 2025). The province's susceptibility arises from its diverse topography, which makes various areas prone to particular and frequently overlapping climate shocks. These shocks encompass glacial lake outburst floods (GLOFs), flash floods, landslides, droughts, heatwaves, and urban flooding. The geographical distribution of these hazards indicates clear patterns throughout the three climatic zones: northern, central, and southern KP. Northern Khyber Pakhtunkhwa (KP), particularly the districts of Swat and Chitral, are highly vulnerable to glacial lake outburst floods (GLOFs), landslides, and riverine flooding resulting from Himalayan glacial melt. Chitral alone is home to approximately 542 glaciers, of which 187 are associated with glacial lakes; however, no systematic research has been conducted to assess the potential hazards these lakes may present (S. Khan et al., 2022). Central Khyber Pakhtunkhwa (KP), particularly the districts of Peshawar and Mardan, are increasingly affected by urban flooding and heatwaves. Urban flooding in these areas is primarily driven by unplanned urban expansion, the conversion of vegetated and agricultural land into impervious built-up surfaces, inadequate infrastructure, and climate-induced extreme rainfall events (Raza & Durrani, 2022; Shujaat et al., 2025). Southern Khyber Pakhtunkhwa

(KP), particularly districts such as Dera Ismail Khan, experiences prolonged drought, water scarcity, and advancing desertification, with annual rainfall frequently ranging between 250–300 mm, significantly lower than the national average of 460 mm (Gul, Riaz, et al., 2024). Scientific evidence underscores the increasing frequency and severity of climate-related events across KP. A frequency modelling study of 36 high-flow river sites in KP confirmed a rising trend in floods, intense rainfall, windstorms, and other extreme weather events (M. Khan et al., 2021). Similarly, a spatio-temporal analysis of droughts in KP (1971–2018) indicated growing drought intensity and frequency, with southern districts being especially affected (Rahman et al., 2021).

The 2010 flood, one of the worst natural hazard-based disasters in Pakistan's history, lasted six months and severely affected Khyber Pakhtunkhwa (KP), impacting nearly 3 million people (Ullah et al., 2025). Around 1 million were displaced, including an estimated 100,000 in Nowshera, as vast areas of farmland, infrastructure, and housing were destroyed (M. A. Jan et al., 2024). In 2022, KP again faced severe flooding, displacing approximately 8 million people (Mahmood et al., 2024). The disaster caused around 300 fatalities and economic losses exceeding USD 260 million (Mahmood et al., 2024). Dera Ismail Khan was among the hardest-hit districts, with widespread damage to homes, roads, health facilities, and major disruptions to agriculture and livestock (Sajjad et al., 2025). KP's climate vulnerability is compounded by its reliance on informal employment, where climate shocks worsen income loss, food insecurity, and service access, while repeated displacement undermines social capital and community cohesion (M. Khan et al., 2025; Ullah et al., 2025; Yousafzai et al., 2022). This dependency reflects a broader national trend, with recent estimates placing Pakistan's informal economy at 35 to 40 percent of GDP (Hayat & Rashid, 2020; Salik, 2025), equivalent to USD 457 billion (Salik, 2025), and a long-term average of 37.75 percent between 1995 and 2017 (Hayat & Rashid, 2020), highlighting a sustained structural reliance on unregulated labor and livelihoods. Earlier figures suggested the informal sector economy was 91 percent the size of the recorded economy in 2007–08 (Kemal & Qasim, 2012), underscoring the scale and persistence of informality that leaves millions, particularly in climate-affected regions such as KP, outside formal protection systems.

As per the Labor Force Survey 2017–18, approximately 72 percent of Pakistan's workforce is engaged in the informal sector, with a higher prevalence in rural areas (76% vs 68% in urban), while the formal sector accounts for a smaller share of employment in rural areas (24% vs 31% in urban) (B. Hussain & Khan, 2021). In KP, informal employment is widespread across subsistence farming, daily wage labor, construction, retail, domestic work, and transport, with manufacturing, construction, and wholesale sectors comprising around 40% of the provincial economy and absorbing much of this labor force, while agriculture, contributing 32.6%, remains the largest (Government of Khyber Pakhtunkhwa,

2023). According to the Household Integrated Economic Survey (HIES) 2015–16, there are 7.35 million household enterprises operating nationwide, with 0.79 million in KP, representing 10.7% of provincial households, operating without legal registration or access to social protection. According to the Household Integrated Economic Survey 2015–16, there are 7.35 million household enterprises operating nationwide, with 0.79 million in KP, representing 10.7% of provincial households, operating without legal registration or access to social protection (Khalid, 2020).

However, informal sector workers in KP remain largely invisible in policy, planning, and literature due to fragmented data and the absence of credible, disaggregated estimates. Limited evidence from KP suggests that low-resilience coping strategies are frequently adopted by informal workers, particularly tenant farmers and daily wage earners, during climate-related events. In the absence of insurance or access to formal financial mechanisms, informal credit is often relied upon, leading to high-interest debt and sustained economic vulnerability (Yousafzai et al., 2022). In KP, heightened risks are faced by informal and low-income households due to inadequate coping mechanisms, limited adaptive capacity, and lack of institutional safety nets, with tenant and landless groups especially affected (Shah et al., 2024; Ullah et al., 2018). Consequently, poverty is reinforced and resilience to recurring climate shocks in KP remains insufficiently understood.

2.5. Gaps in the Literature and Empirical Blind Spots

While global evidence highlights the role of social protection in strengthening climate resilience (Fahrudin et al., 2024), its application in Pakistan remains underexplored. Informal workers, who constitute over 70 percent of the national labor force and an even greater share in rural Khyber Pakhtunkhwa (KP) (Kishwar et al., 2023),face the highest exposure to climate risks yet remain excluded from formal protection systems. As outlined earlier, informal sector workers in KP remain largely invisible in policy and planning due to fragmented data systems and the absence of credible, disaggregated estimates. Tenant farmers, daily wage earners, and small household enterprises often rely on precarious coping mechanisms such as high-interest loans, distress migration, or reduced food consumption (Bhutta et al., 2022; Gul, Khan, et al., 2024; Shah et al., 2021). However, national surveys and administrative datasets provide only aggregate estimates of informality (A. Khan et al., 2024), and fail to capture these lived realities, leaving resilience pathways inadequately understood.

Pakistan has developed both climate adaptation frameworks and large-scale social assistance program such as the Benazir Income Support Program (BISP) and Ehsaas (Hasan & Masood, 2024; Mumtaz, 2018). BISP, widely recognized as one of South Asia's most significant social protection initiatives, has demonstrated measurable impacts on poverty

reduction, nutrition, and education (G. Mustafa et al., 2019; Saeed et al., 2020). It has also been mobilized during crises, such as the 2022 super floods, when PKR 35 billion was disbursed as one-time grants of PKR 25,000 each to 1.76 million households, including many in KP (Zahidullah et al., 2022). Despite this large-scale intervention, little is known about how such assistance influenced the adaptive and transformative capacities of informal workers or contributed to long-term recovery trajectories. Most existing studies rely on top-down quantitative methodologies, drawing on household surveys and administrative data (Awaworyi Churchill et al., 2021; Pasha et al., 2018). While useful for assessing coverage and aggregate outcomes, such approaches offer limited insight into recipients' access, experiences, and perceptions, leaving critical questions on adequacy, agency, targeting, and long-term impacts on climate resilience as well as localized barriers largely unanswered.

The intersection of social protection and climate resilience in Pakistan remains fragmented in both research and policy (A. Khan et al., 2024; S. Nawaz & Iqbal, 2021). Informal workers in KP one of the country's most climate-exposed and socioeconomically marginalized provinces have received little scholarly attention despite their vulnerability (Atteq Ur Rehman & Muhammad Sulaiman, 2025). To address this gap, this study adopts a qualitative, context sensitive approach that foregrounds the lived experiences of informal workers and integrates policy perspectives by exploring the impacts of socio-economic incentives, particularly one-time cash grants and the Benazir Income Support Program (BISP), on the climate resilience of informal sector workers in Khyber Pakhtunkhwa, Pakistan.

3. Methodology

3.1. Aims and Objectives

This qualitative study aims to explore the impacts of socio-economic incentives, particularly one-time cash grants and the Benazir Income Support Program (BISP), on the climate resilience of informal sector workers in Khyber Pakhtunkhwa, Pakistan.

Specific research objectives:

- To explore how informal sector workers perceive the effectiveness of one-time cash grants and the Benazir Income Support Program (BISP) in enhancing their climate resilience in Khyber Pakhtunkhwa.
- To identify the barriers and facilitators that informal sector workers experience in accessing these socio-economic incentives, and to examine how these factors influence the climate resilience of individuals, households, and informal businesses.

- To understand the views and recommendations of informal workers and stakeholders on improving the delivery and effectiveness of these programs in fostering climate resilience.

3.2 Study Area

Khyber Pakhtunkhwa (KP), located in northwestern Pakistan, exemplifies this intersection of climatic and socio-economic vulnerability. With a population exceeding 40 million across 38 districts, predominantly rural, KP is geographically diverse and faces region-specific risks (H. Khan et al., 2023; Nizami et al., 2020). The northern mountainous districts such as Swat and Chitral are threatened by glacier lake outburst floods (GLOFs), landslides, and flash flooding (Ayub et al., 2024; S. Khan et al., 2022). The central plains, including Peshawar and Mardan, grapple with heatwaves and urban flooding exacerbated by rapid urbanization and inadequate drainage (Ayub et al., 2024; Rana et al., 2020). Meanwhile, the southern arid districts, such as Dera Ismail Khan and Tank, frequently experience prolonged droughts, desertification, and acute water scarcity (Rahman et al., 2021). "*Figure 1*" illustrates these climatic zones and associated extreme weather patterns. The informal sector is central to both Pakistan's and KP's economies, sustaining nearly three-quarters of the working-age population and contributing more than 40% of national GDP (Shakeel et al., 2024). Nationally, informal employment constitutes 76% of non-agricultural jobs, with men (75.7%) and women (77.7%) almost equally represented, concentrated in wholesale/retail trade (32.5%), manufacturing (22.8%), and community services (16%) (Muhammad et al., 2024). In KP, especially rural and peri-urban areas, livelihoods revolve around small-scale agriculture, daily wage labor, home-based work, and street vending (Atteq Ur Rehman & Muhammad Sulaiman, 2025; Musaleen, 2022; Zada et al., 2022). Recent disasters highlight their precarious situation: the 2018 floods displaced around one million people in KP (Ullah et al., 2025), while the catastrophic 2022 monsoon floods affected 1.2 million in the province and caused damages exceeding PKR 68 billion (USD 260 million) (Bhutta et al., 2022), devastating infrastructure, agriculture, and household assets (Bazai et al., 2025).

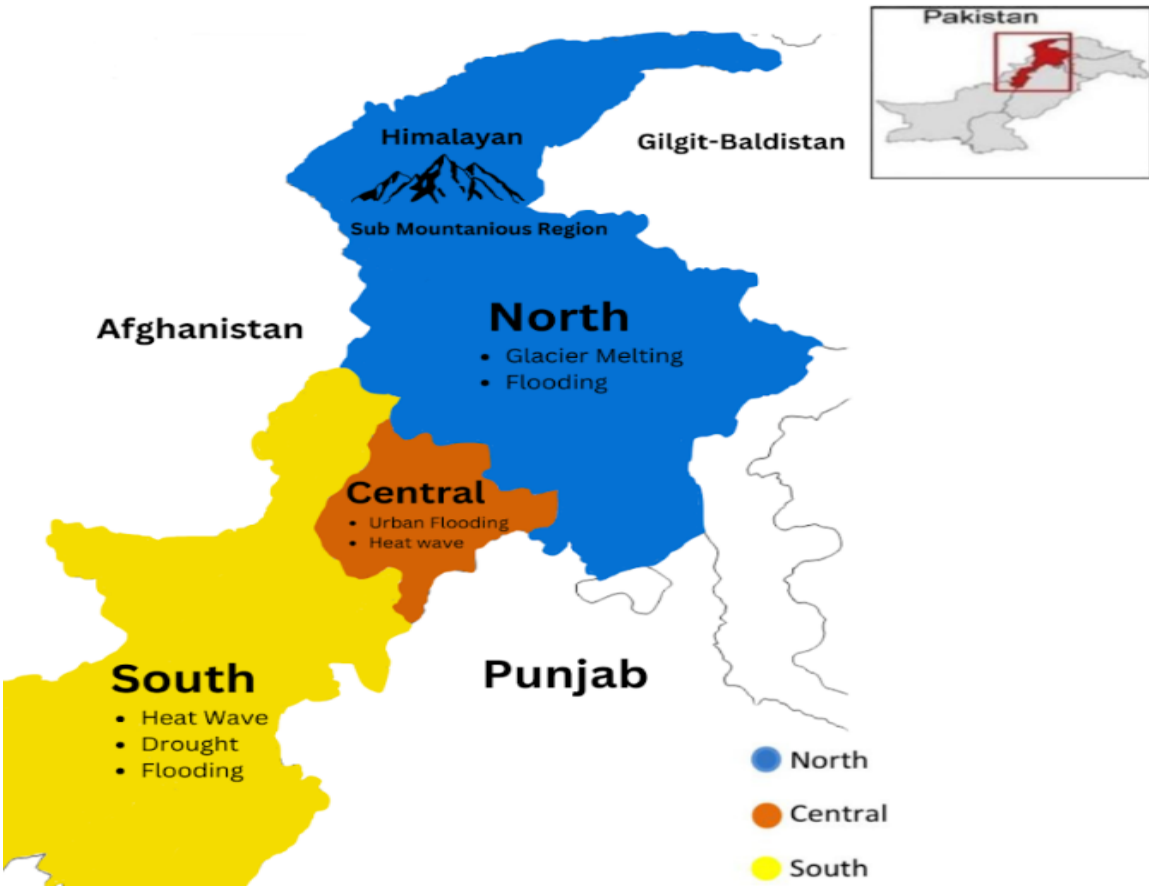

Figure1 illustrates the three climatic zones in KP and their associated extreme weather event patterns.

3.3 Research Design

This study employed a qualitative design informed by a phenomenological orientation to explore how informal sector workers in Khyber Pakhtunkhwa (KP), Pakistan, perceive and experience the role of socio-economic incentives, particularly cash transfers such as the Benazir Income Support Program (BISP) and one-time cash grants, in strengthening their resilience to climate change. Phenomenology was selected as it allows for an in-depth exploration of lived experiences and the meanings individuals assign to their circumstances, particularly in contexts of vulnerability and uncertainty (Creswell, 2014; Emiliussen et al., 2021).

Other qualitative traditions were considered but deemed less appropriate for the study objectives. Grounded theory, designed to generate new theoretical models through iterative comparison (Glaser & Strauss, 2017), was not chosen as the aim was not to develop theory but to deepen understanding of lived experience. Similarly, ethnography, which requires prolonged immersion to study collective cultural practices (Hammersley &

Atkinson, 2007), was excluded as the focus was on individual perceptions rather than cultural systems.

The methodological choice was guided by specific philosophical foundations. A relativist ontology was adopted, recognizing that reality is differently constructed by individuals shaped by their social, economic, and environmental contexts (Burns et al., 2022; Scotland, 2012). Given the diversity of lived realities across KP's climatic regions, this perspective was considered most suitable. A constructivist epistemology further informed the design, positioning knowledge as co constructed between researcher and participant through dialogue and engagement (Romm, 2013; Tanlaka et al., 2025). Grounded in these assumptions, the phenomenological approach prioritized subjective experience over general explanation.

3.4 Sampling and Recruitment

A multistage sampling strategy was employed to ensure representation across geographic, occupational, and climatic diversity in Khyber Pakhtunkhwa, Pakistan. The purpose was to capture a wide spectrum of experiences among individuals of different ages, education levels, and residential contexts, encompassing both urban and rural populations. The study included perspectives from informal sector workers as well as institutional stakeholders engaged in climate resilience and social protection. Participants were recruited from three major climatic zones: the northern, central, and southern regions, each characterized by distinct vulnerabilities. According to the Provincial Disaster Management Authority (PDMA) Khyber Pakhtunkhwa, these districts collectively represent areas of high climate vulnerability, encompassing the province's socio-ecological diversity and hazard variation. The selection was guided by PDMA's hazard-mapping data, which identify the northern zone as highly prone to glacial lake outburst floods (GLOFs), the central plains as exposed to recurrent urban and riverine flooding, and the southern arid belt as facing prolonged drought and heat stress.

The sampling process was conducted in three stages. In the first stage, the three zones were identified. In the second stage, one district was purposively selected from each zone: Swat from the north, Peshawar from the central region, and Dera Ismail Khan from the south. In the third stage, two local government areas were chosen within each district to reflect both urban and peri urban or rural contexts. These included Mingora and Kabal in Swat, Peshawar City and Charsadda in Peshawar, and Dera Ismail Khan and Tank in the southern region.

Eligibility criteria for informal sector workers required participants to be at least eighteen years of age, to be currently engaged in informal employment within one of the selected areas, and to have directly experienced at least one extreme weather event such as

flooding, drought, or a heatwave within the preceding five years. For the purposes of this study, informal employment referred to non-contractual, unregistered, or self-employed work outside formal labor protections or social security coverage. Typical occupations in the selected regions included daily-wage construction labor, street vending, transport work (e.g., rickshaw drivers), home-based handicrafts, domestic work, agricultural labor, and waste collection. Individuals were excluded if they had previously served as paid community mobilisers, volunteers, or informants for aid distribution agencies, as their responses were likely to reflect institutional rather than personal perspectives. Individuals with cognitive, speech, or language impairments that could not reasonably be accommodated were also excluded from participation. These exclusions were applied due to the study's reliance on verbal qualitative methods (in-depth interviews and focus group discussions), where meaningful participation required interactive dialogue. The research team lacked access to trained interpreters and adaptive tools (e.g., sign language, visual support) necessary to ensure ethical and accurate data collection. The decision was therefore based on practical and ethical considerations of data integrity and informed consent, rather than intent to exclude.

For institutional stakeholders, eligibility was defined as holding an active professional role in social protection, disaster response, or community development within the selected districts. Those occupying purely administrative or symbolic roles without direct engagement with communities were excluded.

Participant recruitment was supported by local community networks, including elders, peer groups, and representatives of non-governmental organizations in the study areas. These contacts helped build trust, introduced the study, and connected the research team with potential participants who were then approached in person at their homes, worksites, or community gathering spaces. Informal sector workers were then approached by the research team, given an information leaflet outlining the study aims, institutional affiliation, and intended use of the findings, and briefed on the study objectives before being invited to participate voluntarily. This approach was particularly effective in reaching women, mobile workers, and residents of socially conservative or remote areas. Both informal sector workers and institutional stakeholders received clear information about the study purpose, data collection procedures, confidentiality measures, and the voluntary nature of participation. Those who expressed interest confirmed their participation through a short telephone call with the research team, during which a convenient time and location for the IDI or FGD was arranged. All sessions were conducted in private, with only the research team and participants present, to provide a safe and comfortable setting for open discussion.

In total, forty-five informal sector workers were approached, with fifteen identified in each climatic zone. Of these, thirty participants, ten per zone, consented to participate in IDIs, whereas fifteen declined, primarily citing time constraints, competing work demands, or limited interest in research participation. No participants withdrew after providing consent. To capture institutional perspectives, six focus group discussions (FGDs) were conducted, two in each climatic zone, with six participants per group, yielding a total of thirty-six institutional stakeholder participants. These participants represented a range of governmental, semi-governmental, and non-governmental institutions, including the Provincial Disaster Management Authority (PDMA), district administration offices, the Benazir Income Support Programme (BISP), Ehsaas programme, health and social welfare departments, and local NGOs and community-based organizations involved in disaster response and livelihood support. All invited stakeholders consented to participate, and no withdrawals were reported.

3.5 Data Collection

A semi-structured interview topic guide (Appendix 1a and 1b) was developed by the research team at Khyber Medical University, Pakistan. The guides were designed in line with the study objectives and informed by a review of literature on climate resilience and socio-economic support in low- and middle-income settings. The development was further strengthened by the team's multidisciplinary expertise, which included a senior qualitative researcher and principal investigator (PhD in Public Health, MSc, BDS), a global health specialist and co-principal investigator (PhD in Epidemiology and Biostatistics, MD), a climate financing expert (MSc), a climate change specialist (PhD in Environmental Sciences, MD), a public health field worker (MSc in Health Data Science), and a qualitative research associate (MPhil in Public Health). Two guides were produced: one for in-depth interviews (IDIs) with informal sector workers and the other for focus group discussions (FGDs) with institutional stakeholders. Participants for the IDIs were recruited through purposive sampling to capture diversity in age, gender, occupation, and geographic zones (northern, central, and southern).

Local community leaders and field contacts facilitated access to informal sector workers, including daily wage laborers, street vendors, and home-based workers. Eligible participants were approached at their worksites, provided with a study information leaflet outlining the aims of the research, the institutional affiliation of the investigators, and the intended use of the findings, and were briefed on the study objectives before being invited to participate voluntarily. Institutional stakeholders for the FGDs were recruited using criterion-based purposive sampling to ensure representation of perspectives from those directly engaged in disaster preparedness, health, and social protection. Study information leaflets and formal invitations were distributed to local government representatives,

disaster management personnel, education officers, and community health workers, with participation arranged in advance through official letters and follow-up telephone communication.

Three research associates (one male, two female) received structured training in qualitative interviewing, including neutral and non-directive strategies to minimize interviewer bias. To strengthen authenticity and reflexivity, each associate maintained reflective notes after every session. IDIs were conducted at participants' worksites to ensure convenience and comfort, with privacy safeguarded by the respective associate in each region (north, central, south). Each IDI lasted approximately 30 minutes and was conducted one-on-one in the participant's preferred language (Pashto or Urdu). FGDs were conducted across the three study zones in private school rooms to ensure a safe and confidential setting. Each FGD lasted 30 to 45 minutes, was facilitated by the female principal investigator, and included institutional stakeholders of both genders from the respective regions. Prior to each session, participants were invited to ask questions and were given time for clarification.

Written informed consent was obtained following a comprehensive briefing on study procedures, which included participants' right to withdraw, the anonymization of data through the use of unique identification codes, and secure storage on password-protected devices. Explicit consent for audio recording was also obtained. The first IDI and FGD were conducted as pilots to assess the appropriateness of the topic guide; as no substantive revisions were required, these data were retained and incorporated into the final analysis. Data saturation, defined as the point at which no new codes, themes, or insights emerge from continued data collection (Malterud et al., 2016), was reached after thirty IDIs and six FGDs, when subsequent data failed to generate additional findings. To ensure methodological rigor, the research team held regular debriefing meetings to examine emerging insights, address procedural challenges, and refine the analytical direction. The study was conducted and reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Appendix 2) (Tong et al., 2007).

3.6 Data Analysis

To facilitate systematic data management, coding, and retrieval, thematic analysis was conducted using ATLAS.ti (version 1.8) (B. Smit & Scherman, 2021). Data were analyzed using Braun and Clarke's reflexive thematic analysis (Braun & Clarke, 2006). While the study was not phenomenological in the strict methodological sense, the analysis was informed by a phenomenological orientation, with attention directed to participants' lived experiences (Campbell et al., 2021). Reflexive TA was chosen for its epistemological flexibility, allowing the analysis to stay grounded in participants' narratives while enabling interpretive engagement with the wider systems influencing those experiences (Braun &

Clarke, 2024). Unlike descriptive phenomenological methods such as Colaizzi's (1978), which aim to identify a universal essence (Morrow et al., 2015), reflexive TA does not seek fixed essences. Instead, it enabled the team to theorize patterned meanings across diverse groups, capturing both individual experiences and their wider contexts (Byrne, 2022). All IDIs and FGDs were conducted in the local languages (Pashto and Urdu) and transcribed *ad* verbatim into English. As an ethical measure, participants were offered the chance to review their transcripts and interpretations; however, no modifications were sought.

The analysis followed Braun and Clarke's six phases of thematic analysis, used in a flexible and recursive way rather than as a strict step-by-step process. First, two researchers became familiar with the data by reading transcripts several times, listening to recordings, and making notes. Second, they coded the transcripts, marking both what participants said directly and the ideas behind their words. Third, similar codes were grouped into possible themes. Fourth, these themes were checked against the data to make sure they were clear and consistent. Fifth, each theme was defined and given a name that captured its main idea. Sixth, the findings were written up as a narrative, supported by selected quotes to show both differences and common patterns across participants. Throughout the process, the researchers kept reflective notes about how their own backgrounds and perspectives might shape the analysis. Regular team discussions were held to question assumptions, compare interpretations, and agree on the final themes.

3.7 Ethical Considerations

This study received ethical approval from the Khyber Medical University Ethics Board (Reference: Dir/Ethics/KMU EB EC 00106). All research activities were conducted in accordance with the Declaration of Helsinki and national regulations such as the Pakistan Data Protection Act 2020. Written informed consent was obtained from all participants after they were briefed on the study's purpose, procedures, voluntary nature, and their right to withdraw at any time without consequence. To maintain anonymity, unique identification codes were assigned to each transcript, and all personal identifiers were removed. Participants also consented to audio recording. Data were stored in encrypted folders on secure devices accessible only to the research team. In line with Khyber Medical University's five-year data retention policy, all data will be retained for five years before permanent deletion and will not be shared outside the approved team.

Potential power imbalances were addressed by ensuring cultural and gender sensitivity. The principal investigator, a female researcher fluent in local languages, supervised data collection, while research associates from the study regions facilitated communication and reduced the risk of participants feeling pressured to engage with outsiders. Two sources of bias, selection bias and recall bias, were anticipated. Selection bias was reduced through multistage sampling to include participants from diverse geographical and socio-

demographic backgrounds. Recall bias was minimized through the use of contextual probes during interviews and training interviewers in neutral, non-directive questioning. To strengthen credibility, participants were offered the opportunity to review their transcripts; none requested revisions. Reflective notes were maintained, and regular team debriefings were held to review findings and ensure consistency in interpretation.

4. Results

A total of 30 informal sector workers participated in the study "*Table 1*", with equal representation from the North (n = 10), South (n = 10), and Central (n = 10) regions. The sample comprised a higher proportion of females (n=16, 56.7%) compared to males (n=14, 43.3%). Participants' ages ranged between 25 and 55 years, with a mean age of 38.0 years (SD = 9.0). Educational attainment was generally low. Two-thirds of the participants (n=20, 66.7%) had attained only primary-level education, while the remaining 33.3% had completed education up to the secondary level. Housing status reflected marked socio-economic precarity: one-third (n=10, 33.3%) of respondents resided in mud houses, 23.3% in semi-permanent structures, and 20% in concrete houses, while others lived in rented rooms, flats, or informal shelters. Occupational engagement reflected the heterogeneity of informal work. The most frequently reported livelihoods were domestic work (16.7%), farming (16.7%), and home-based businesses (16.7%). Other forms of employment included casual labor/ daily-wage work (10%), street vending (6.7%), tailoring (6.7%), shopkeeping (6.7%), and low-wage activities such as waste picking, gardening, and service provision. Household dependency levels were considerable. Nearly half of the participants (46.7%) reported a high number of dependents (≥4), while 36.7% reported medium dependency (2–3 dependents), and only 16.6% reported low dependency (1 dependent).

Table 1. Summary of Socio-demographic and Household Characteristics of Informal Sector Worker Participants (n = 30)

Characteristic	Category	n	%
Age Group (years)	18-29	6	20.0
	30-39	9	30.0
	40-49	9	30.0
	50 and above	6	20.0
Gender	Male	12	40.0
	Female	18	60.0
Occupation	Farmer	7	23.3
	Domestic/Service Worker	6	20.0
	Home-based Business	5	16.7
	Casual Labour/Daily Wage	3	10.0
	Street Vendor/Shopkeeper	4	13.3
	Other (Tailor, Electrician, Gardener, Waste Picker)	5	16.7

Region	North (Swat)	10	33.3
	Central (Peshawar/Charsadda)	10	33.3
	South (D.I. Khan/Tank)	10	33.3
Location	Urban	15	50.0
	Rural/Peri-urban	15	50.0
Education Level	Primary or below	18	60.0
	Secondary	12	40.0
Type of Housing	Mud/Semi-permanent	17	56.7
	Brick/Concrete	13	43.3
Dependents Level	Low (1-2 dependents)	6	20.0
	Medium (3-4 dependents)	12	40.0
	High (5 or more dependents)	12	40.0

A total of 36 institutional stakeholders participated in the study, see "*Table 2*". The majority were male (n=25, 69.4%), with females comprising (n=11, 30.6%). Regional representation was evenly distributed, with 12 participants drawn from each of the Central, North, and South climatic zones. Participants' ages ranged from 26 to 59 years, with a mean age of 42.8 years (SD = 9.3); the mean age for males was 44.0 years and for females 40.3 years. With respect to education, most stakeholders (n=26, 72.2%) had attained tertiary-level qualifications, while the remainder (n=10, 27.8%) had completed education up to the secondary level. Years of professional experience varied considerably, ranging from 4 to 25 years, with an overall mean of 11.1 years. Stakeholders from the South zone reported the highest mean work experience (13.3 years), followed by those in the Central (10.3 years) and North (9.8 years) zones.

Table 2. Summary of Socio-demographic and Professional Characteristics of Institutional Stakeholder Participants (n = 36)

Characteristic	**Category**	**n**	**%**
Region	North (Swat)	12	33.3
	Central (Peshawar/Charsadda)	12	33.3
	South (D.I. Khan/Tank)	12	33.3
Gender	Male	23	63.9
	Female	13	36.1
Age Group (years)	25–34	7	19.4
	35–44	9	25.0
	45–54	13	36.1
	55 and above	7	19.4
Education Level	Secondary	9	25.0
	Tertiary (Bachelor's/Master's)	27	75.0
Institutional Type / Sector	Disaster Management & Rescue (PDMA, Rescue 1122)	8	22.2
	Environment / Climate / Forestry	8	22.2
	Health / Emergency Medicine / Healthcare Commission	7	19.4

	Social Safety Nets (BISP, Social Welfare, Ehsaas)	7	19.4
	Agriculture / Climate Finance / Other Government Agencies	6	16.8
Location	Urban	15	41.7
	Rural / Peri-urban	21	58.3
Work Experience	0–5 years	4	11.1
	6–10 years	10	27.8
	11–15 years	9	25.0
	16 years and above	13	36.1

Thematic Findings

Analysis of the interviews and focus group discussions generated five main themes and ten sub-themes, reflecting participants lived experiences and stakeholder perspectives on the role of socio-economic incentives in climate resilience. The themes and sub-themes are summarized in Table 3.

Table 3. Overview of Themes and Sub-Themes

Themes	Sub-Themes
1. Inadequate and Inflexible Financial Support	1.1 Static Assistance Amid Dynamic Crises 1.2 Debt, Instability, and Recovery Fatigue
2. Barriers to Accessing Social Protection	2.1 Digital Gaps and Bureaucratic Complexity 2.2 Cultural and Logistical Barriers
3. Gendered Constraints and Local Power Structures	3.1 Aid Without Autonomy 3.2 Gatekeeping and Informal Exploitation
4. Everyday Adaptation and Informal Resilience	4.1 Social Networks and Mutual Aid 4.2 Flexible Routines and Low-Cost Innovations
5. Stakeholder Perspectives on Program Gaps and Future Directions	5.1 Misalignment with Climate-Specific Needs 5.2 Recommendations for Climate-Sensitive Social Protection

Theme 1: Inadequate and Inflexible Financial Support

Subtheme 1.1. Static Assistance Amid Dynamic Crises

Participants across rural and urban settings emphasized that while social safety nets and one-time grants offered temporary relief, fixed amounts and quarterly disbursements were inadequate to meet the scale and duration of climate-related crises. Rural households, particularly those dependent on farming and livestock, stressed that seasonal and disaster-induced vulnerabilities were poorly matched to such rigid support structures.

> A rural participant reflected: *"The cash from the social program and one-time grants provided immediate help, which we used for food and some crop medicines. However,*

> *the funds were quickly depleted since support comes only every three months. As we depend on farming for income, I invested part of it in hopes of a good harvest. Unfortunately, the limited and infrequent support does not address larger issues, especially during floods or bad weather, and it doesn't help us prepare for the long term or recover from major losses."* (ID-9, Farmer)

Urban informal workers similarly reported that assistance helped with short-term expenses, such as rent and utilities, but was insufficient to address lost income or the broader economic impacts of climate-related disruption.

> *"My earnings are still tied to the weather. During the hot months, I cut back on stock to prevent spoilage, which means lower sales. When rain wrecks the roads, customers stop showing up and supplies get delayed. I spent some of that money on a small freezer for cold items, which was a short-term fix. It also helped with rent during the rough months and covered basic necessities like food and medicine. However, the support doesn't account for business losses or assist in getting back on track when things go south. Access to quality food and private healthcare is still out of reach."* (ID18, Shopkeeper)

While some respondents described using funds to expand small-scale livelihoods, these efforts were repeatedly undermined by climate disruptions.

> *"I can't really say that the support has boosted my income since I still rely on selling flowers, seeds, and plants from my garden to help my family. However, it did provide me with some extra cash to grow my business. I used some of that money to buy essential tools and cover transport costs to local markets. The weather, though, is a real challenge. Heavy rains and heatwaves frequently ruin my plants or hinder my ability to reach customers. Sometimes, roads get blocked, making it tough to deliver orders or bring in supplies on time. The assistance is helpful to some extent, but it doesn't fully address the actual costs of these setbacks. As a gardener, I really need steady support that can safeguard my work and income when the weather doesn't cooperate."* (ID4, Gardener)

Stakeholders echoed these perspectives, noting that programs such as the Benazir Income Support Program (BISP) were primarily designed for poverty alleviation and maternal health, and lacked climate-specific responsiveness. However, stakeholders highlighted that the program does provide one-time cash grants in climate events but lacks the overall flexibility and responsiveness needed to address the acute and evolving challenges posed by climate-induced shocks and stresses.

> *"In the floods of 2022, the government handed out an extra Rs. 12,000, but honestly, that was just a tiny fraction of the massive losses. Whole crops were destroyed, livestock died, and families had to start over from scratch. The truth is, programs like BISP and*

> *unconditional cash transfers weren't really set up with climate resilience in mind. They overlook areas and people that are frequently hit by floods, droughts, and other disasters. These payments aim to help with women's education, health, and reducing poverty but they really don't cut it when it comes to ongoing climate crises."* (FGD South, P25)

Subtheme 1.2. Debt, Instability, and Recovery Fatigue

The precariousness of informal work left individuals highly vulnerable during climate events, often forcing them into debt. Rural participants described being trapped in cycles of borrowing to cope with agricultural and livestock losses.

> *"After the floods wiped out my crops and drowned my livestock, I had to take out a loan from a local lender with high interest just to cover food and basic necessities. I'm still paying that off, and every season adds more stress. We built a shed for the cows, got a bore machine for water, and bought steel containers for milk storage but everything relies on electricity. When the power goes out or the rains are heavy, we can't work. We're currently trying to get a solar panel, but it's expensive. Just when we start to make progress, something pulls us back, and the debt keeps piling up. It feels like an endless battle just to keep our heads above water."* (ID3- Farmer)

Urban informal workers similarly reported borrowing to survive when floods or storms disrupted customer flows and reduced income.

> *"However, when heavy rains flooded the streets, customers stopped coming. That's when things got really tough. We receive Rs. 12,500 every three months, which is helpful, but it's not sufficient especially during emergencies. If the money came in monthly, it would really make a difference. Even during normal times, we find it hard to make ends meet, and when a flood or heatwave strikes, everything goes downhill. I had to borrow from family just to keep afloat. Once you get into debt like that, it's really difficult to bounce back."* (ID-12, Casual Laborer)

Stakeholders reported that repeated disasters left communities in a state of "recovery fatigue," unable to rebuild before the next crisis struck. The frequency and severity of climate events, coupled with inadequate support structures, leave little room for meaningful recovery or long-term resilience.

> *"In Khyber Pakhtunkhwa, communities are stuck in a constant loop of rebuilding. Every flood or heatwave brings new losses, whether it's crops, livestock, homes, or health. Recovery rarely finishes before another disaster strikes, and we find ourselves scrambling*

> *to tackle the next problem. There's no solid prevention strategy in place, neither financially nor in terms of climate."* (FGD Central, P-2)

Theme 2: Barriers to Accessing Social Protection

Subtheme 2.1. Digital Gaps and Bureaucratic Complexity

Participants highlighted that limited literacy and digital inaccessibility significantly hindered access to social protection services, particularly in rural areas and among women. Many, especially older adults, reported difficulties with reading, writing, and using mobile technologies. The absence of smartphones, unfamiliarity with SMS-based systems, and confusion regarding registration procedures further restricted their ability to engage with available support mechanisms.

> In this regard, a participant shared: "*My wife and I struggle to grasp mobile apps and point-of-sale systems, which complicates things for us. The SMS notifications we get are also puzzling and hard to make sense of. All of this just adds to the confusion and stress we deal with during the whole process."* (ID-7, Electrician)

Stakeholders acknowledged that digitalization improved program efficiency but left vulnerable groups behind.

> *"Since our launch in 2008-2009, we've seen a big digital shift. Initially, we operated as a paper-based transfer program, but by 2015, we teamed up with NADRA to transition to ATM cards. Then in 2018, we collaborated with various banks for mobile cash transfers, which has improved our data management. However, this shift has also left many people behind, particularly women in rural or low-literacy areas. They often don't know where to go or how to sign up. If we don't address this gap, even the most well-designed programs will fail to reach those who need assistance the most."* (FGD Central, P6)

By contrast, urban workers with smartphones and workplace connectivity described smoother experiences:

> *"Once I finally managed to apply and get registered, the process became much easier. At my workplace, we have good Wi-Fi access, and with smartphones, it's now simpler to stay informed. We receive SMS notifications when the money is ready, and we just go to the local POS to collect it. That part has become quite smooth."* (ID-2, Home based business)

Yet across both urban and rural contexts, misinformation, missed announcements, and bureaucratic hurdles limited access. Rural residents were particularly disadvantaged by the long travel required to reach distant centers.

> *"Whether you're in the village or the city, many of us face the same problems. At first, I didn't know how to apply and had to ask around. Some shops turned me away, saying only certain ones handled applications. When I finally found the right place, they said my wife wasn't eligible, so we had to go to NADRA to prove otherwise, which caused further delays. In cities, people may also deal with paperwork issues, but they can usually reach offices more easily. In rural areas, it means long trips on broken roads and multiple visits, especially when documents are missing. Many people, like us, miss out on aid or deadlines simply because the process isn't clearly explained. The system may be simple, but the confusion makes it much harder than it should be."* (ID-19, Seasonal Farmer)

Subtheme 2.2. Cultural and Logistical Barriers

Participants explained that in rural areas, cultural expectations around female modesty and family honor made it difficult for women to move freely. They shared that women were often expected to be accompanied by male relatives, which meant they could not travel independently. As a result, many described facing delays or even missing appointments related to program enrolment, cash collection, or biometric verification under the BISP when male family members were busy with work, unwell, or otherwise unavailable. They added that this reliance on escorts also prevented them from accessing services quickly or in emergencies, reducing their chances of receiving timely support.

> *"For women in our Pashtoon culture, things are even harder. They're not allowed to travel alone and always need a male family member to go with them for safety and respect. But we're often busy or not around, so they end up missing appointments or deadlines just because they can't go on their own. These restrictions keep them dependent and make it hard for them to speak up or do things for themselves. In the end, it's not just the women who are affected, this holds back progress for the whole community."* (ID30, Farmer)

Stakeholders confirmed that such cultural restrictions, combined with infrastructure breakdowns, particularly disadvantaged women, children, and persons with disabilities.

> *"During disasters, people often struggle to access any kind of facilities, whether it's healthcare or social funds, especially in rural areas. Women are particularly affected due to cultural and religious practices. On top of these cultural barriers, groups like pregnant women, children, and individuals with congenital disabilities face even greater challenges because of physical limitations. For them, the impact is intensified by both physical and cultural obstacles."* (FGD North, P23)

In urban contexts, women described somewhat greater autonomy enabled by transport and digital tools:

> *"Luckily, living in the city makes things a bit simpler. I can hop on public transport to get to the office, and even now, when the quarterly payments arrive, I go to pick up the cash myself from a POS. I have a daily bus pass, receive a text on my phone, and just head out."* (ID-13, Domestic Worker)

Travel infrastructure remained a barrier in rural areas, where poor roads and distant centers made aid collection highly burdensome.

> *"After the flood, the roads were in terrible shape, and the closest center was about 50 kilometers away. I had to borrow a motorcycle, and even then, I found myself walking a long way because the road was blocked. By the time I arrived, the office was already closed. They only work during specific hours, so if you miss that time frame, you have to do the entire trip all over again. It's really tough, especially when you live far away, depend on others for rides, and there's no decent public transport."* (ID-20, Shopkeeper)

Theme 3: Gendered Constraints and Local Power Structures

Subtheme 3.1. Aid Without Autonomy

Participants observed that gendered constraints were present in both rural and urban settings, though they noted that rural women experienced stricter enforcement of patriarchal norms and fewer opportunities to contest them. While women were registered as beneficiaries of program such as the BISP and one-time cash grants, participants explained that many did not have full control over how these funds were used. This was more evident in rural households, where finances were generally managed by men, and husbands or other male relatives often made the main spending decisions, leaving women with limited influence over the use of financial support.

> *"I handle the money, but my husband or in-laws are the ones who decide how it's spent. No matter if we're in the village, gender issues persist. Women still have to get the green light from male family members or elders before they can access funds from social programs, whether it's BISP or cash grants after a disaster. It really doesn't make us feel empowered."* (ID-12, Casual Laborer)

In urban contexts, some women described slightly greater autonomy, particularly those with independent incomes or digital literacy, yet patriarchal expectations still constrained their agency.

> *"The money is in my name, I go and collect it, and I get to decide how to use it. But sometimes my husband asks for it, claiming he's low on cash for his work, and I feel like I have no choice but to hand it over. I have to live with him and we have kids together.*

> *There have even been times when I've had to use this social support to help pay off his debts."* (ID-5, Home Tutor)

Stakeholders emphasized the need for programs to move beyond disbursement towards supporting women's empowerment and shifting gender norms.

> *"But the program needs to go beyond just giving out cash every few months. Real empowerment for women requires teamwork across different sectors like health, education, disaster management, and gender equality. We really need to move from just keeping an eye on cash distributions to looking at real empowerment results. Are women seeing significant changes in their homes, communities, and lives? Just cash isn't sufficient; true impact comes from changing norms, creating more opportunities, and making sure that support leads to lasting independence and respect."* (FGD South, P32)

Subtheme 3.2. Gatekeeping and Informal Exploitation

Participants in both rural and urban areas reported encountering gatekeeping, corruption, and informal exploitation in accessing social safety nets. Rural women, with limited mobility and social networks, were particularly disadvantaged.

> *"It's tough to keep a good attitude, you get the sense that nothing progresses unless you fork over some cash, and if you don't, you might end up waiting forever. There were plenty of shady practices when I was going through the application process, whether at the application centers or with the sales agents who hand out the funds. Even they take a slice of the money you're meant to get."* (ID-26, Domestic Worker)

Urban participants described navigating these challenges through persistence, connections, or digital literacy, though informal payments and unhelpful officials remained common.

> *"My family had gone through the application process before, so they filled me in on what to expect, which really helped. But the officials I dealt with for registration were totally unhelpful; they kept asking for money to process my application. They didn't even bother to say hello properly and wanted to know if I was ready to hand over a part of the money I'd get from the Benazir program or any other social aid, whether it was regular or for disasters. When I said no, they claimed I wasn't eligible. Luckily, a relative stepped in and guided me through the application at a different center, where the staff were way more supportive thanks to our social ties."* (ID-15, Waste picker)

Stakeholders acknowledged these issues, noting longstanding patterns of leakage and corruption, though highlighting that reforms and monitoring were being introduced.

> *"Back in 2020, we saw investigations into fund skimming, with reports of people who weren't beneficiaries receiving funds, including some government officials. Most of the issues reported involved local retail outlets taking money from beneficiaries. Even a World Bank impact evaluation pointed out that women beneficiaries were less satisfied because of fund leakage through human agents. Some solutions are already in the works; the program is focusing on third-party monitoring, audits, grievance support, strict penalties for those caught embezzling, and increasing the number of female staff in the program."* (FGD North, P4)

Theme 4: Everyday Adaptation and Informal Resilience

Subtheme 4.1. Social Networks and Mutual Aid

Participants described resilience in rural areas as being rooted in kinship structures and informal social networks, which provided important support during crises such as floods or prolonged power outages. In the absence or weakness of formal safety nets, these networks based on family ties, neighborhood relations and shared experiences offered shelter, food, labor and emotional reassurance. Participants noted that such community relationships helped households cope, adapt and recover, and played a key role in responding to recurring climate shocks.

> *"Whenever floods, heatwaves, or droughts occur, our extended family has always been there for us. I recall staying at their house during the floods when we had to evacuate, and during heatwaves or water shortages, we often seek refuge with them due to their better electricity and more reliable water access. It's never questioned; it's simply the norm. The sense of unity is essential for families like ours. It provides support during difficult moments, aids in our adaptation when circumstances change unexpectedly, and facilitates our recovery after challenges. It shapes how we fight with the ongoing problems caused by the changing climate."* (ID-22, Tailor)

In urban contexts, networks existed but were weaker and often limited to short-term, charity-like gestures. However, even within these brief connections, individuals received meaningful support during climate related events, including help with clothing, food expenses, and housing.

> *"In our neighborhood, during climate-related emergencies, people occasionally help each other out, but it's usually just a one-time gesture. In big cities, the assistance during such events often follows a predictable pattern. Wealthier individuals tend to provide clothing, food, or shelter, but it often feels more like charity rather than genuine support for long-term recovery. In times of crisis, affluent families may help those in need, but*

> *they typically don't invest the time or effort to help rebuild lives; they simply lack the capacity for that."* (ID-11, Service Worker)

Stakeholders emphasized the importance of informal social networks, noting their role in food sharing, providing shelter, supporting rescue efforts and facilitating communication.

> *"Communities often rely on informal networks, like neighbors helping each other out during bad weather. In Khyber Pakhtunkhwa, this culture of helping one another is well-rooted, covering shelter, transport, rescue, food sharing, financial aid, and even local early warning systems. Many families welcome those who have lost their homes, while others use local resources like tractors or boats to transport at-risk families to safer areas. Community members frequently share basic food items or organize group meals funded by mosques. Plus, word-of-mouth alerts and announcements from mosques serve as common early warning systems, emphasizing the crucial role of community unity, which is built on social ties and mutual support in times of crisis."* (FGD Central, P3)

Subtheme 4.2. Flexible Routines and Low-Tech Innovation

Both rural and urban participants described adopting practical, locally driven adaptations to cope with climate extremes. In rural areas, work schedules were adjusted to avoid peak heat, and low-cost innovations supported survival.

> *"When it's super-hot outside, we like to get our work done early in the morning or after the sun goes down. We typically kick things off before the sun rises and steer clear of working during the peak heat of the day."* (ID-9, Farmer)

Rural participants highlighted that these locally driven adaptations reflect their practical knowledge, traditional practices, and a deep understanding of their environment.

> *"When flooding is expected, we design makeshift boats to transport our livestock and families to safer areas. We're familiar with local rainfall patterns and try to align our planting cycles with the weather to improve crop yields. Rainwater harvesting is important to us; we store water in barrels and underground tanks because our region experiences unpredictable shifts from droughts to heavy rainfall. We've seen it all."* (ID-19, Seasonal Farmer)

Urban participants relied more on market-based solutions, such as solar energy, refrigeration, and schedule adjustments.

> *"I've set up some solar panels at my place, along with a battery system that kicks in during power outages. I've got a low-watt solar-powered fan and cooler hooked up to it to help with the heat. I also make an effort to wrap up my work early in the day before it*

gets too hot. When floods hit, we depend on the solar system to keep our essential devices powered, and we use solar lights and rechargeable torches since the electricity is typically out during those times." (ID-15, Waster Picker)

Stakeholder participants observed that communities modified their daily routines, tools and practices to manage risks during extreme weather events, drawing on indigenous knowledge as well as emerging technologies.

"As summer's heat up, they're moving their work to the cooler early mornings or evenings. Weather changes are affecting school attendance, leading to more home-based schooling, and altering how people collect water for cooking. There's a noticeable shift towards using solar-powered batteries, fans, lights, and direct current systems. Whether you're in the village or the city, you can see this change. Through traditional practices, people are relying on old methods like using woven beds outside or on rooftops, and mud walls provide better natural ventilation compared to concrete houses. Farmers are quite skilled at observing river flows and animal behavior to develop early warning systems." (FGD South, P 36)

Theme 5: Towards Responsive and Climate-Sensitive Aid

Subtheme 5.1. Disaster-Specific, Localized Relief

Participants highlighted the inadequacy of static, poverty-focused initiatives such as BISP in responding to disasters. One-time cash grants were described as neither sufficient nor tailored to local needs.

"Disasters don't wait for lists. Aid needs to be delivered right away, ideally through mobile transfers. Programs like BISP are pretty rigid—they only offer fixed, quarterly payments to those on the list, without any extra help when a climate disaster hits. The payment amount stays the same no matter the losses and doesn't consider immediate recovery, long-term adaptation, or diversifying livelihoods. Even one-time disaster cash grants don't really meet actual needs—they usually don't cover losses like damaged homes, lost livestock, or destroyed crops. Often, the funds are just enough to buy food, but not sufficient for relocating or rebuilding." (ID-23, Domestic Worker)

Urban participants suggested reforms to make aid more responsive, including mobile cash transfers, tailored support, and livelihood diversification.

"People who live in areas prone to floods, droughts, or heatwaves should definitely be on a list to receive assistance, and this list needs to be reviewed and updated at least once a year. When a disaster strikes, they should receive emergency funds immediately through mobile apps like Jazz Cash or Easypaisa, no waiting around. However, this support

> *shouldn't just last a few days. It should also help people rebuild their lives. For instance, if someone lost their livestock in a flood, they should be provided with new goats or chickens. If their crops were ruined, they should receive seeds and farming equipment. If heatwaves damaged their sewing machine or handcart, they should get help to replace those items. The program should also focus on teaching people new skills and assisting them in starting small businesses such as mobile repair, sewing, or farming that can adapt to changing weather so they can earn money again and truly recover."* (ID-5, Home Tutor)

Stakeholders similarly noted that current systems lack climate indicators and recommended piloting adaptive approaches, including pre-disaster payments and microinsurance.

> *"BISP provides some relief... but it wasn't specifically created for disasters related to climate change. Genuine recovery calls for a comprehensive approach. We need to test an adaptive social protection system within BISP operations, targeting only those individuals who are at verified climate risk. Vulnerability mapping is crucial for pre-disaster payments, where high-risk households are identified in advance. Payments should be made through easy mobile cash transfers instead of just offering reactive support when a climate crisis hits. We also need microinsurance for small-scale farmers and climate resilience funds that link disaster-related public financing from government or international donor sources. We need a shock-responsive and forward-thinking adaptive system for BISP that not only focuses on reducing poverty but also on building climate resilience."* (FGD Central, P4)

Subtheme 5.2. Early Warning and Infrastructure Gaps

A consistent pattern across urban and rural contexts was frustration with weak early warning systems and inadequate infrastructure. Rural residents particularly noted significant delays in receiving alerts and in accessing evacuation routes.

> *"If we had received an early warning, we could have saved our belongings. By the time we understood what was happening, the floodwater had already reached our doorstep. During emergencies, mobile phones often shut down due to power outages, and internet services become unavailable, leaving us completely cut off. The warning systems either do not function or are entirely absent. As a result, we lost essential tools and important documents when the drainage systems collapsed and roads remained blocked for nearly a week. It is unfortunate that our region lacks a regional weather station that could keep us informed in real time."* (ID-13, Construction Worker)

Urban participants described accessing early warnings through multiple channels, but noted the lack of consistency and reliability.

> *"I remember a time when we received a flood alert via an announcement at the mosque it had a significant impact. We require that type of local alert system in all communities. Sometimes we receive text messages or automated calls, and occasionally we find updates on social media, TV, or radio. However, these alerts can be unreliable. There is a pressing need to enhance the accessibility, frequency, and clarity of early warnings so that everyone, no matter their location, can prepare in a timely manner."* (ID-21, Home-based Business)

Stakeholders emphasized the absence of localized forecasting systems and recommended strengthening coordination, investing in technology, and developing community-based warning networks.

> *"It's not too tough to set up early warning systems in Pakistan. We could kick things off by bringing together platforms like NDMA and PDMA, along with real-time dashboards. We should invest in forecasting models and monitoring systems, especially in provinces that are prone to extreme weather. Plus, we can train local volunteers, like climate activists, to act as ambassadors for early warning systems and help build community-based initiatives. Improving communication is key, so we should use radio and SMS to send localized early alerts instead of the usual generic extreme weather warnings. For instance, we could notify people that a specific area is expected to have 4 feet of water in the next 24 hours. Right now, we just get a standard voice message or text. International donor agencies could also help with capacity building for community training and evacuation drills. These are all basic yet essential steps for enhancing early warning systems."* (FGD North, P20)

5. Discussion

This study explored the role of socio-economic incentives, particularly one-time cash grants and the Benazir Income Support Program (BISP), in shaping the climate resilience of informal sector workers in Khyber Pakhtunkhwa, Pakistan. Four major themes were identified by participants: (1) Inadequate and Inflexible Financial Support; (2) Barriers to Accessing Social Protection; (3) Gendered Constraints and Local Power Structures; (4) Everyday Adaptation and Informal Resilience; and (5) Towards Responsive and Climate-Sensitive Aid. Generally, participants felt that while socio economic incentives such as cash transfers provided short term relief, they were often insufficient, difficult to access, shaped by gendered and local power dynamics, and ultimately left workers reliant on their

own everyday adaptive strategies, underscoring the urgent need for more responsive and climate sensitive forms of social protection.

Our findings highlight that while cash transfers provide important short-term relief, the design and implementation of social protection schemes remain poorly aligned with the dynamic, recurrent, and long-term nature of climate risks. This reflects broader debates in resilience literature, where resilience is often narrowly defined as a short term “bounce back” capacity, enabling individuals and systems to withstand shocks without collapsing (Béné et al., 2014; Ulrichs et al., 2019). In line with these debates, our findings also resonate with a component of the Resilience Capacities Framework (RCF), namely absorptive capacity, which refers to the ability of households to absorb shocks without falling into deeper poverty, often by smoothing consumption or offsetting losses. Comparable evidence from Kenya’s Hunger Safety Net Program (HSNP), Ethiopia's Productive Safety Net Program (PSNP) and Mexico’s conditional cash transfer schemes illustrates the role of cash transfers in strengthening absorptive capacity (Maione, 2020; Ulrichs et al., 2019). However, while such transfers can provide immediate protection, they often fall short in enabling productive investment and proactive adaptation, or in addressing the cumulative and long term nature of climate risks, unless complemented by interventions such as access to credit, training, or asset provision (Tenzing, 2020).

Our findings highlighted that access barriers were a major constraint to program success, emerging in two key contexts. First, digital exclusion, low literacy, and bureaucratic complexity placed a disproportionate burden on rural and marginalized groups. Second, women faced intersectional disadvantages, with patriarchal norms restricting their mobility, compounded by low digital literacy and reliance on male relatives to withdraw or manage transfers. These findings align with critiques that true digital inclusion requires not only top-down government systems but also supportive community relationships that provide easy-to-use tools, maintain non-digital options during transitions, and offer local training (A. Smit et al., 2025). Similarly, the literature suggests that although social safety nets provide support, many individuals from poor households face barriers such as bureaucratic hurdles, which create psychological strain and informational challenges (Moffitt et al., 2023). Furthermore, our findings revealed that corruption, gatekeeping, and informal deductions undermined both trust in and the net value of social protection program among participants. These findings are consistent with the literature, as independent evaluations and reviews of the BISP in Pakistan have repeatedly documented similar challenges, highlighting elite capture and leakage as persistent threats to the programs credibility (Mughal & Baig, 2024). In addition, our findings on gender and cultural barriers align with programmatic recommendations from LMICs that emphasize strengthening gender relations at the individual, household, and community levels to improve the effectiveness of social protection program (Holmes & Jones, 2013).

Moreover, in Pakistan, our findings are consistent with existing evidence that social protection programs often neglect gender concerns, excluding women in the informal economy through documentation barriers, which denies them benefits despite eligibility, reduces assistance to support without empowerment across family, individual, and community spheres, and fosters pathways for hidden forms of exploitation (Hassan & Ahmad, 2014).

Our findings highlighted everyday adaptation and informal resilience in two main contexts. First, community ties and solidarity enabled individuals to cope collectively during crises. Second, practical adjustments such as changes in work routines, rainwater harvesting, and small-scale solar adoption were described as key strategies for coping with climate-related challenges. These findings align with the concept of social resilience, particularly adaptive capacity, which helps reduce vulnerability to future shocks, as also evidenced in studies from Nepal and Bangladesh where kinship and neighborhood ties are indispensable to survival in disaster-prone settings (Choudhury & Haque, 2016; Hossain et al., 2023). Similarly, evidence from a recent systematic review of 71 studies highlights that community agency, indigenous knowledge, and innovative coping strategies are central to how communities, especially in Africa and Asia, adapt to climate change by enhancing prediction, preparedness, and survival (Dorji et al., 2024).

Our findings identified major barriers in disaster-specific, localized relief and early warning systems, primarily linked to infrastructure gaps. Participants emphasized the importance of flexible and rapid mechanisms, such as mobile cash transfers, to ensure timely and context-specific support. This aligns with global best practices in adaptive social protection, which stress anticipatory financing and the design of shock-responsive systems tailored to particular hazards. Participants also underscored the urgency of embedding climate-sensitive design into BISP through measures such as vulnerability mapping, climate triggers, and microinsurance mechanisms, reflecting recent calls to better align climate finance with social protection frameworks in LMICs (Aleksandrova et al., 2024; Huber & Murray, 2024). Similarly, participants highlighted that Pakistan's disaster risk governance remains fragmented, with limited investment in localized early warning infrastructure and heavy reliance on community-based mechanisms. In the context of Pakistan, strengthening disaster management institutions such as the National Disaster Management Authority (NDMA) and the Provincial Disaster Management Authorities (PDMAs) to operate proactively rather than reactively has been identified as a key pathway for building shock-responsive resilience (Anis, 2023; Batool et al., 2024; Ishrat & Hameed, 2024). Suggested measures include the development of real-time monitoring dashboards, the establishment of local weather stations, and the promotion of community-based communication through trained volunteers (Dutt Bhatta et al., 2020; M. A. Jan et al., 2025; Mukhtar, 2018; D. Mustafa et al., 2015). Similarly, in the South Asian context, community-embedded early

warning systems and locally actionable alerts have been shown to significantly reduce disaster-related losses, with notable examples from Bangladesh and the Philippines (Al-mueed et al., 2021; Gumiran et al., 2019).

To the best of our knowledge, this is the first qualitative study from Pakistan to explore the role of social safety nets in shaping the climate resilience of informal sector workers. Nevertheless, several limitations should be considered when interpreting the findings. First, as a qualitative study, the results are not statistically generalizable to all informal sector workers in KP or Pakistan. However, the purpose of qualitative inquiry is not generalization but rather the generation of rich, transferable insights. Second, the study focused on KP, one of Pakistan's four provinces. While the inclusion of participants across three distinct climatic zones enhanced variability, the findings may not fully capture the experiences of informal workers in other provincial contexts. Third, although efforts were made to ensure gender balance in both IDIs and FGDs, cultural constraints limited women's participation, particularly among stakeholder groups. This underrepresentation may partly reflect the limited presence of women in leadership positions in many LMICs. Fourth, the reliance on self-reported narratives about extreme weather events and social safety net programs introduces the possibility of recall bias. To mitigate this risk, prompts and contextual probes were incorporated into the topic guides to facilitate accurate recollection.

Despite these limitations, the study provides valuable preliminary evidence on how socio-economic incentives intersect with climate resilience among informal workers in KP. The findings highlight systemic gaps and offer actionable recommendations for designing climate-sensitive, inclusive, and adaptive social protection programs in Pakistan and comparable LMIC settings.

6. Recommendations and Policy Implications

Based on the present study's findings and discussion, several recommendations can be made to strengthen the role of social safety nets such as BISP and one-time cash grants in building climate resilience among informal sector workers in Pakistan:

1. Incorporate climate sensitivity into social safety net design

BISP should move beyond its current poverty-focused orientation to embed climate-smart social protection systems. This includes shifting from static quarterly transfers to dynamic mechanisms that reflect the recurrent nature of climate shocks. Mobile cash transfers, rapid disbursement systems, and disaster-contingent top-ups during emergencies can

enhance timeliness and relevance. Strengthening the nexus between climate change, humanitarian response, and long-term development will enable BISP to serve as a transformative, rather than minimal, safety net.

2. Shift from absorptive to transformative resilience

While BISP currently supports short-term absorptive resilience, long-term resilience requires investment in adaptive and transformative capacities. This could be achieved by integrating complementary interventions such as access to credit, skills training, livelihood diversification, and asset provision. Such measures would enable households to invest in climate-resilient housing, livelihoods, and enterprises, reducing dependency on temporary transfers.

3. Improve accessibility and eligibility

Regularly updating the beneficiaries' database through poverty and climate vulnerability surveys especially in climate-prone districts would enhance program responsiveness. Aligning the BISP model with Disaster Risk Reduction (DRR) frameworks can strengthen targeting. Additionally, training female community facilitators to assist rural women with low literacy levels in enrolment and access processes would improve inclusivity and reduce reliance on male intermediaries.

4. Strengthen governance and accountability

To address corruption, elite capture, and leakages, BISP may adopt a hybrid accountability model. Top-down measures, such as technology-driven transparency and standard-setting, should be complemented by bottom-up approaches that empower communities to monitor, validate, and co-design processes. Local grievance redress mechanisms and citizen oversight structures would create two-way accountability, where institutions are answerable to citizens and citizens have meaningful ways to shape and oversee the program.

5. Enhance inter-agency coordination for climate resilience

Effective resilience requires not only social protection but also integration with early warning systems and disaster risk governance. National and provincial disaster management authorities (NDMA and PDMA) should collaborate with BISP to establish climate-smart safety nets. Practical measures include training community-based early warning ambassadors, providing institutional recognition and support for their roles, and strengthening localized, actionable warning systems that link with social protection delivery.

This study contributes to the growing body of Global South scholarship highlighting the intersection of informal work, gender, and climate vulnerability (Dodman et al., 2023;

Hussainzad & Gou, 2024; Kadungure et al., 2023; Winter et al., 2025). While prior studies from Kenya and Zimbabwe demonstrate that women in informal settlements exhibit remarkable adaptive capacity despite structural inequalities (Kadungure et al., 2023; Winter et al., 2025), this current research findings from Pakistan extends this discourse by revealing how social safety nets such as BISP and one-time cash grants, mediate women's resilience through financial, institutional, and social pathways. In line with the call to mainstream climate resilience within public-health and governance systems in India (Ravindra, 2025), our findings underscore that economic transfers alone are insufficient without addressing the cultural and infrastructural constraints that limit women's agency.

By situating Pakistan's experience within this broader Global South literature, this study reinforces the need for gender-transformative, climate-smart social protection systems that integrate local knowledge, community participation, and cross-sectoral coordination. It highlights the importance of co-producing resilience with women and informal workers as central agents of adaptation rather than passive beneficiaries, thereby advancing a more inclusive, equity-driven model of transformative resilience for climate-vulnerable populations across LMICs.

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Appendices

Appendix 1a

Interview Semi-Structured Topic Guide

Please introduce yourself and explain the purpose of the study.
Prompt: Explain why the study is being conducted and what it will involve.

Assure confidentiality; obtain verbal and written consent.
Prompt: Emphasize anonymity, voluntary participation, right to withdraw.

Collect background details: age, gender, occupation, years in the informal sector, household size.
Prompt: Record demographic details before moving to main questions.

Tell me about any changes you have noticed in the weather over the years.
Prompt: Extreme heat, floods, droughts, seasonal shifts.

How have these weather changes affected your work, income, or daily life?
Prompt: Impact on jobs, productivity, family routines.

What challenges have you faced because of these changes?
Prompt: Financial losses, health problems, displacement.

What strategies do you use to cope with these challenges?
Prompt: Savings, loans, community help, reduced spending, alternative work.

Are you aware of programs like the Benazir Income Support Programme (BISP) or one-time cash grants?
Prompt: Ask if they have heard about these programs.

Have you or your family received any such support?
Prompt: Who received it, when, and how often?

How effective has this support been for you?
Prompt: Was it enough, timely, useful?

Did it help you prepare for or recover from floods, heatwaves, or droughts? If yes, how?
Prompt: Cover examples of recovery, rebuilding, prevention.

How easy or difficult was it to apply for and receive financial support?
Prompt: Registration, paperwork, technology use.

What challenges did you face in accessing these programs?
Prompt: Lack of information, delays, corruption, distance to centres.

What made the process easier for you?
Prompt: Support from family, digital tools, community leaders.

How do these barriers affect your recovery from climate disruptions?
Prompt: Delays in aid, debt, inability to rebuild or prepare.

How did your household or business use the financial support?
Prompt: Food, rent, healthcare, farming, business investment.

Did it help with income stability, food, or healthcare?
Prompt: Better diet, medical treatment, regular income.

Did it make your work or business more resilient to climate challenges? In what ways?
Prompt: Buying equipment, saving for emergencies, reducing losses.

What improvements would make these programs more effective for workers like you?
Prompt: Higher amounts, quicker payments, disaster-specific aid.

What other types of support (for example, training, insurance, loans) would help improve climate resilience?
Prompt: Skills development, affordable credit, crop/livestock insurance.

If you could suggest one major change to these programs, what would it be?
Prompt: Flexibility, transparency, gender inclusion.

Do you have any final thoughts or suggestions?
Prompt: Allow space for anything not yet covered.

Thank the participant for their time.
Prompt: Acknowledge their contribution and close respectfully.

Appendix 1b

Focus Group Discussion (FGD) Topic Guide

Welcome participants and introduce yourself.
Prompt: Briefly explain your role and thank them for joining.

Explain the purpose of the discussion: to explore the role of socio-economic incentives (BISP and one-time cash grants) in enhancing climate resilience for informal sector workers.
Prompt: Clarify that discussion will focus on program effectiveness, access, and future improvements.

Assure confidentiality and encourage open discussion.
Prompt: Emphasize anonymity, voluntary participation, and respectful sharing.

Obtain verbal and written consent.
Prompt: Confirm agreement to participate and collect signed consent forms.

Collect background information in written form: name (optional), gender, age group, organization/department, role, and years of professional experience.
Prompt: Use a short form or sheet before beginning the discussion.

What kinds of changes in weather or climate have been observed in recent years?
Prompt: floods, heatwaves, droughts, unseasonal rainfall.

In what ways have these changes affected work, income, or daily routines within the community?
Prompt: impact on agriculture, informal work, health, family life.

What challenges have emerged due to these climate-related changes?
Prompt: income loss, migration, food insecurity, health issues.

How have communities been coping with these challenges?
Prompt: loans, savings, relocation, community help.

What traditional practices or local support systems have played a role in managing these impacts?
Prompt: kinship networks, religious/community institutions, local leadership.

What is known about financial assistance programs such as cash transfers or emergency relief initiatives?
Prompt: awareness of BISP, government aid, NGO programs.

How are these programs perceived in terms of their effectiveness in helping people recover from climate-related disruptions?
Prompt: adequacy, timeliness, fairness, trust.

What examples exist of financial assistance making a difference in households or communities?
Prompt: rebuilding homes, restarting businesses, accessing healthcare or food.

How accessible are these financial support programs to different groups?
Prompt: women, elderly, disabled people, rural vs urban households.

What barriers have been experienced in accessing assistance?
Prompt: lack of information, application difficulties, corruption, delays.

What conditions or factors have helped facilitate access to support?
Prompt: community leaders, NGO support, mobile technology, family networks.

How have these barriers influenced the ability to recover from climate impacts?
Prompt: delays in aid, debt cycles, slower recovery.

In what ways has financial support been utilized?
Prompt: food, healthcare, education, rebuilding livelihoods.

Has this support contributed to improved income stability, food security, or business continuity?
Prompt: examples of reduced vulnerability or improved resilience.

How does financial support enhance long-term resilience to climate-related challenges?
Prompt: preparedness, savings, investment in safer housing or equipment.

What changes could be made to improve the effectiveness of financial support programs?
Prompt: increase amounts, speed up payments, expand coverage.

What additional forms of support would strengthen climate preparedness?
Prompt: vocational training, access to credit, insurance, disaster preparedness.

What is one key recommendation for improving socio-economic support systems in the context of climate impacts?
Prompt: policy reform, transparency, gender inclusiveness, coordination.

Do participants have any final thoughts or suggestions?
Prompt: allow space for anything not yet discussed.

Thank participants for their time and valuable insights.
Prompt: acknowledge their contributions and close respectfully.

Appendix 2

Consolidated Criteria for Reporting Qualitative Studies (COREQ): 32-Item Checklist

No.	Item	Guide questions/description	Reported on Page #
Domain 1: Research team and reflexivity			
Personal characteristics			
1	Interviewer/facilitator	Which author(s) conducted the interview or focus group?	13–14
2	Credentials	What were the researcher's credentials? e.g., PhD, MD	13
3	Occupation	What was their occupation at the time of the study?	13–14
4	Gender	Was the researcher male or female?	14
5	Experience and training	What experience or training did the researcher have?	13–14
Relationship with participants			
6	Relationship established	Was a relationship established prior to study commencement?	13–14
7	Participant knowledge of the interviewer	What did participants know about the researcher? e.g., personal goals, reasons for doing the research	13
8	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g., bias, assumptions, reasons and interests in the research topic	13–14
Domain 2: Study design			
Theoretical framework			
9	Methodological orientation and theory	What methodological orientation was stated to underpin the study? e.g., grounded theory, discourse analysis, ethnography, phenomenology, content analysis	12
Participant selection			
10	Sampling	How were participants selected? e.g., purposive, convenience, consecutive, snowball	12

11	Method of approach	How were participants approached? e.g., face-to-face, telephone, mail, email	12–13
12	Sample size	How many participants were in the study?	13
13	Non-participation	How many people refused to participate or dropped out? Reasons?	13
Setting			
14	Setting of data collection	Where was the data collected? e.g., home, clinic, workplace	14
15	Presence of non-participants	Was anyone else present besides the participants and researchers?	13
16	Description of sample	What are the important characteristics of the sample? e.g., demographic data, date	16–18
Data collection			
17	Interview guide	Were questions, prompts, or guides provided by the authors? Was it pilot tested?	14
18	Repeat interviews	Were repeat interviews carried out? If yes, how many?	N/A
19	Audio/visual recording	Did the research use audio or visual recording to collect the data?	14
20	Field notes	Were field notes made during and/or after the interview or focus group?	14–15
21	Duration	What was the duration of the interviews or focus groups?	14
22	Data saturation	Was data saturation discussed?	14
23	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	14
Domain 3: Analysis and findings			
Data analysis			
24	Number of data coders	How many data coders coded the data?	14
25	Description of the coding tree	Did authors provide a description of the coding tree?	N/A
26	Derivation of themes	Were themes identified in advance or derived from the data?	14
27	Software	What software, if applicable, was used to manage the data?	14
28	Participant checking	Did participants provide feedback on the findings?	14
Reporting			
29	Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified (e.g., participant number)?	18–27

30	Data and findings consistent	Was there consistency between the data presented and the findings?	18–27
31	Clarity of major themes	Were major themes clearly presented in the findings?	18–27
32	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	18–27