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CLIMATE CHANGE AS A THREAT MULTIPLIER: IMPLICATIONS FOR PAKISTAN'S NATIONAL SECURITY

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Abstract
This study examines The Impact of Climate Change on Pakistan's national security, framing climate change as a threat multiplier. The research explores how extreme weather events, water stress, and food insecurity have intensified vulnerabilities in Pakistan's domestic stability, economic resilience, and regional relations. This research also focused on the growing link between climate change and national security challenges in Pakistan. Using a qualitative research design and an analytical approach analyzed government reports, NDMA data, and security literature. It identifies three key linkages: increased frequency of floods and heatwaves undermining internal security through displacement and civil unrest; glacial melt and erratic monsoons straining Indus water flows, aggravating India-Pakistan water disputes; and climate-induced agricultural losses threatening livelihoods, fueling radicalization in vulnerable districts. Findings indicate that climate impacts have shifted from environmental concerns to direct national security challenges, exposing institutional gaps in disaster response and inter-agency coordination. Climate change is increasing security challenges such as water scarcity, food insecurity, and displacement in Pakistan. It indicated that climate change is a major factor contributing to instability and national security risks. The study concludes that Pakistan must integrate climate adaptation into its security doctrine and advocates a comprehensive climate-security strategy combining early-warning systems, transboundary water diplomacy, and climate-resilient development to safeguard long-term national security, and it must develop effective policies to address climate-related security risks.

Keywords*: climate change, national security, challenges, scarcity, early warning systems*

Introduction:

Pakistan's national security is seriously threatened by climate change (Khan, 2019). Among the various aspects that comprise national security are military, economic, human, food, cyber, and environmental security. The integrity of the nation's security is jeopardized when any of these components are compromised. Climate change is increasingly undermining all these facets of Pakistan's national security. For instance, severe heat waves in locations like Karachi, Sindh, have claimed many lives. In Pakistan, flooding has also been a persistent issue, leading to crop degradation, animal losses, and fatalities. This was exemplified by the terrible flood in 2022, which the government believes killed over 2000 people and inflicted damages of about USD 30 billion. (Khan, 2019). Additionally, heat waves around the country have impacted the lives of several people. The most recent flood is the greatest calamity Pakistan has ever experienced, with damages surpassing those of any previous flood-related tragedy. (World Bank,2023) This flood makes it abundantly clear that climate change poses a major threat to Pakistan's national security since it significantly affects the agricultural sector, which is crucial for both food and economic stability. The deaths caused by flooding and heat waves

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Vol.04 No.01 (2026)

have further threatened human security. The devastation of the agricultural sector consequently puts Pakistan's broader security frameworks, including food and economic security, at jeopardy. Consequently, it has been concluded that Pakistan's national security is seriously threatened by climate change. If proper mitigation and adaptation measures are not taken, Pakistan's sustainability will suffer greatly. (Abbasi, 2022).

Particularly for states like Pakistan that are most susceptible to its effects, climate change is a major national security threat. Among Pakistan's greatest threats are severe weather, food shortages, water scarcity, and forced migration. The political and social instability that already exists is being made worse by these problems. Pakistan's primary revenue streams are the Indus River system and its agricultural sector. Therefore, climate stressors have the potential to cause internal discontent and affect the country's relations with its neighbors. Investigating the complex connections between Pakistani national security and climate change is the aim of this study. It will focus on how environmental problems lead to resource-related conflicts, relocation, and social and political challenges. Using qualitative research, case studies, and policy evaluation, the study will identify Pakistan's main vulnerabilities and provide practical suggestions for strengthening its defenses against security threats related to climate change. Industrialization and advances in science and technology have brought many benefits to humanity. To fulfill the increasing demands of an expanding population, industrialization is necessary. Therefore, it makes sense to describe progress and industrialization as a necessary evil of the contemporary era. (Ahmed, Farid, & Ashraf, 2021).

Literature Review

Pakistan confronts significant threats to its national security because of a combination of topographical and geophysical factors that lead to frequent extreme weather occurrences, in addition to participating in national and international talks. The Indus Basin is the source of over 70% of Pakistan's surface water flows, underscoring the importance of climate change effects and their relationship to the country's security strategy. Climate change could exacerbate conflicts over a few resources, increasing the threat to Pakistan's national security. More than 68% of countries have declared climate change a national security issue, making it a significant danger to global security and economy, particularly in Pakistan. However, as climate change is a global issue that necessitates an immediate global response to mitigate its effects, Pakistan's efforts may not be successful. (Syed et al., 2022).

Pakistan faces numerous challenges as a developing economy, which are exacerbated by the harsh consequences of climate change. It is particularly worrisome because climate change is having a detrimental effect on Pakistan's agricultural output. Taking everything into account, climate change is a major issue that presents massive difficulties for humanity. South Asia is experiencing the adverse effects of climate change, much like other regions of the world. The increasing climatic unpredictability, characterized by changes in temperature and precipitation, has a significant impact on water supplies, the occurrence of waterborne infections, and ultimately human health, which depends on having access to clean water. The patterns of climate change are also making water-related diseases like cholera and typhoid more dangerous. The citizens of many developing nations have suffered the most over the past ten years as economic progress has slowed due to a lack of resources to deal with regular natural disasters. With 70% of its population at risk from natural disasters, Pakistan is the fifth most vulnerable nation in the world (Shahid, 2021).

Significant global economic impact of climate-related disasters, highlighting the exorbitant expense of mitigation efforts. Pakistan has put forth a plan assuming that enough money and external assistance are secured to cover the estimated $40 billion total cost. The country must also choose how to mitigate and adapt to climate change, which is anticipated to

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cost $7 billion to $14 billion annually. Pakistan's economy is primarily reliant on agriculture, which, as previously mentioned, has already encountered several challenges due to climate change. Food security depends on this sector, which employs about 22% of Pakistan's workers and generates 22% of the nation's annual GDP. (Chaudhry, 2017).

According to the Water and Power Development Agency (WAPDA), Pakistan's surface water supply per capita has drastically declined, from 5,260 m^3 in 1951 to just 1,000 m^3 in 2008, and more declines are anticipated. 93% of crops' needs are met by fresh water, hence a decrease in the water supply has an adverse impact on agricultural productivity. In addition, Pakistan's other water supplies are running low. Grain production is predicted to be short by 12 million tons between 2012 and 2023. Additionally, 3.2 million hectares of important food crops have been devastated, affecting 7.9 million acres of cultivated land. Falling water levels in Pakistan are caused by flooding, which is closely linked to the country's economic circumstances. The 2012 floods alone caused damage to over 14% of the total cultivated land, necessitating the restoration of affected farms and communities for 8 billion Pakistani rupees (Looney, 2012). Pakistan's economy, which is dependent on agriculture, needs a steady supply of fresh water for agricultural cultivation because of the erratic patterns of yearly rainfall. Glaciers may melt more quickly because of rapid temperature increases, which would significantly affect the water supplies needed for agriculture. Additionally, the western alpine regions are becoming dryer due to climate change. High temperatures have also resulted in floods and landslides in these hilly areas. Since 2010, Pakistan has seen five consecutive floods and landslides, resulting in economic damages exceeding $25 billion. Rehabilitation and relocation operations have cost billions of Pakistani dollars because of the catastrophic consequences of these disasters on agricultural land, irrigation systems, health infrastructure, and educational facilities (Hussain et al., 2022)

Pakistan, the second most populous country in South Asia, is known for its arid regions and poor agricultural output. The country's diverse geography contributes significantly to its wide range of climates. More than 60% of the entire watershed area of the Indus Basin is in Pakistan. Consequently, these vulnerable regions, notably about sea level rise and glacier retreat, with Karachi and Baluchistan being severely affected. Temperatures have noticeably increased over the last 20 years, as well as an increase in floods, droughts, and cyclones (most notably in 2010, 2012, and 2022), as well as in 2007 and other years. Many areas are susceptible to flooding and landslides because they are classified as dry or semi-arid. Research indicates that around 22.8% of Pakistan's land area and 49.6% of its population are seriously at risk from the harmful effects of climate change. Furthermore, Pakistan's dependence on agricultural production makes it more susceptible in terms of food security. This security is threatened by recurring floods, waterlogging, land degradation, increasing pest infestations, and other disasters that have repeatedly occurred. A 1°C temperature increase is predicted to reduce wheat yields by 6–9%, while other crops like cotton and mangoes would suffer (Mustafa, 2011).

Focused on Pakistan while examining the grave issues brought on by climate change, which has grown to be a major concern for people worldwide. According to the IPCC reports, the processes of adaptation and mitigation may have both beneficial and detrimental consequences on productivity and other social objectives, such as economic stability, food security, environmental sustainability, and human health (IPCC, 2012, p. 5). Contributing factors include the overall lack of awareness among the people regarding the detrimental impacts of climate change and the lack of modern strategies to counteract climate threats. The findings also demonstrate that climate change causes extreme weather and climatic occurrences in Pakistan. The country is facing threats from both local and foreign sources, including

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

significant temperature rises, unpredictable seasonal patterns, changes in precipitation and snowfall, rising sea levels, faster glacier melting, urban flooding, and falling sea ice levels (Shahid & Adnan, 2021).

Relationship between Climate Change and National Security

Pakistan, which is home to more than 235 million people and has a land area of 881,913 square kilometers, exhibits a broad variety of precipitation and temperature fluctuations. The nation is known for its varied geography and temperature, which includes a range of tropical and temperate climates. High mountain regions have the climate of the rich Indus plains is semi-arid to semi-arid, that of the Balochistan Plateau, Cholistan, and Thar Deserts is hyper-arid, and that of the coastal Indus delta along the Arabian Sea is subtropical. It is well recognized that Pakistan's security is seriously threatened by the effects of climate change. The primary causes of climate risk are an increase in extreme weather events and an ever-increasing annual intensity and frequency of rainfall changes. From 1998 to 2017, Pakistan experienced 145 climate extreme events, with an average of five events annually. These events include droughts, floods, including the 2010 and 2022 mega-flood, which caused heavy snowfall in the northern mountains, heat waves, cyclones, heavy rains, and landslides that resulted in displacement and migration, which further exacerbated the government's struggles to maintain socio-economic stability and national security (Hina and Saleem, 2019).

In addition to their direct effects, climate-related disasters have indirect implications on Pakistan's national security by acting as a multiplier of conflict and posing a non-traditional danger matrix. The already scarce infrastructure and resources are strained by the displacement and migration caused by climate change. Social tensions, rivalry for resources, and possible confrontations between impacted populations result from this. Furthermore, by interfering with agricultural operations, extreme weather events jeopardize food security, which in turn exacerbates socioeconomic disparities and fuels civil instability. A thorough plan to lessen and prepare for the effects of climate change, including investments in disaster preparedness, resilient infrastructure, and sustainable development practices, is urgently needed, given the compounding consequences of climate change on Pakistan's national security. To lessen the effects of climate change on regional stability and security, it is imperative that the transboundary nature of the phenomenon be addressed through international cooperation and support. (Ahmed,2021).

Climate Change and National Security Threat for Pakistan

Given the current situation in Pakistan, the famous Swedish environmental activist Greta Thunberg's declaration, "Our house is on fire," is apt (Thunberg, 2020). Pakistan's national security is currently under threat from climate change. The danger is increasing. The growth in natural disasters, the migration of refugees, and conflicts over food and water are all consequences of climate change. Another problem is that Pakistan's national resources are insufficient to address these escalating dangers (Aslam, 2024). Sindh is the only province in Pakistan that has seen all the major flood types urban and coastal, flash, and river floods during the past 25 years. Over time, floods have increased in frequency, resulting in severe economic and human losses in Sindh. Due to monsoon rains that the city's drainage systems were unable to sufficiently drain, Karachi had the worst urban floods of the century in 2020. In recent years, there has been an increase in heavy rains; last year, Karachi had torrential rains that lasted for many days, resulting in multiple fatalities and electrocution instances. The majority of Karachi was underwater, and the city's main thoroughfares were inundated, severely impairing people's daily lives. (Farid & Ashraf, 2024)

When several feet of water flooded the streets, those who lived close to rural regions, such as the Malir River, were forced to relocate. The poor drainage system made matters worse.

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

As a result, an emergency was declared in Karachi by the civil administration, with assistance from the army, which started rescue and restoration efforts. To handle the crises brought on by the intense rains, relief camps were established in the city. To give impacted individuals with food and medical care, special Pakistan Army Emergency Response teams were established. Recent floods have had a significant impact on Thatta in Sindh. Complete communities in coastal areas have been forced to relocate due to recent floods. Fishermen were forced to relocate to make a living. A suitable system for tracking the distribution of flood relief is lacking. That Pakistan failed to take the 2010 floods as a lesson is disheartening. It has become abundantly evident how devastating the latest floods have been. The fact that any funds that Pakistan receives under the damage fund are not being used for their intended purpose is regrettable (Fahad,2020).

With assistance from the World Bank, the Ministry of Planning created the "Pakistan Floods 2022 Post-Disaster Needs Assessment" assessment. The analysis estimates that the floods caused US$14.9 billion in total economic damage to the country The province of Sindh experienced constant rain in 2022. Devastating floods were caused by the constant rain. The crisis was not well handled by the National Disaster Management Authority (NDMA). Consequently, Sindh's government proclaimed a state of national emergency. Devastation affected three-fourths of the nation, including numerous Sindhi areas. Additionally, the situation worsened due to a shortage of resources. It was a massive catastrophe, and the state lacked the funds to handle it. Approximately 20 million people have lost their homes, according to government estimates. The catastrophe had grown to epic dimensions. (Siyal, 2023). In the end, the administration established tent communities for the affected populace. Significant damage was done to the Pakistan-Afghan border crossing in Chaman; heavy rains disrupted pedestrian traffic; floods suspended the gas supply in Baluchistan; the Sui Southern Gas Company pipeline in Bolan halted the gas supply to several areas, including Mastung, Kalat, Pishin, and Quetta; in addition to power outages in other areas, the power supply from the 220 KV transmission line from Sibi to Quetta also failed; and the historic 140-year-old railway bridge in Bolan. According to the Provincial Disaster Management Authority (PDMA), many individuals have perished in KPK, mostly because of roof collapses brought on by floods, and many more were killed by car sweeping (Shabir,2020).

Flooding, rising sea levels, erosion, and storms pose a hazard to Pakistan's coastal people and infrastructure. Mastung, Quetta, Lasbela, Killa Abdullah, and Pishin are among Baluchistan's most severely affected regions. Its methods for disposing of liquid and solid waste are insufficient. For nearby coastal towns that rely on fishing as a source of income, this practice is causing more problems. Plastic pollution is on the rise and is predicted to increase significantly by 2050.There is a lot of pollution in the coastal areas between Gwadar and Lasbela. The sea surface temperature is changing quickly. Thus, the livelihood of impoverished fisherman has been impacted by rising pollution and sea surface temperatures. Today, Makran's coastal lands in Baluchistan are seriously threatened. The 780 kilometers of coastline that stretch along Pakistan's deep sea international economic boundary provide a living for many people living in the coastal regions of Baluchistan. Therefore, climate change could spell the difference between life and death for the inhabitants of Baluchistan. (Muzaffar, Jathol, & Yaseen, 2023).

Sea erosion has caused the loss of about 3.5 million acres of land in Sindh's coastal areas, especially in the districts of Badin and Thatta. This is a significant loss of land and livelihood. Climate change has turned Thatta into a desert city today. Today, there are major threats to its environment, territory, and population (Khawaja, 2020). The wheat crop suffered greatly last year because of extreme temperature fluctuations. Rainfall is essential to Pakistan's

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

agriculture in more than 60% of cases. Wheat grains typically take 10–12 days to develop, however sudden temperature changes have shortened that time to four days. The grain's weight and size thus diminish, which eventually results in less of the staple crop being produced. Pakistan is already trying to supply the essential domestic wheat needs. This loss will make things worse in such a situation. In certain regions of Pakistan, there are ongoing water shortages. Cholistan is among the most impacted regions. There are acute water shortages there. People no longer have animals, which was their primary source of income. An estimated 8–10% drop is anticipated until 2040, with wheat being one of the main losers. Climate change will also influence Basmati rice yields in the upcoming years. In Pakistan, rice is a vital crop. Similarly, climate change is causing crop seasons to alter and shrink, according to The Global Change Impact Study Centre. Sea encroachment is rendering Pakistan's productive land unusable. (Nadeem,et al. 2023).

In Badin, hundreds of acres of agricultural land have been lost because of marine incursion. New diseases are also made possible by this problem. Once more, the agriculture industry will be impacted. Pakistan's economy depends heavily on agriculture in several ways. First, the agriculture industry provides a living for millions of people. Second, it gives the state extremely low-cost raw materials to operate various businesses, such as textiles and leather. Above all, in a state like Pakistan, it ensures food security. It is the most valuable and irreplaceable possession. Nearly 58% of people are food insecure today. The seriousness of the crisis is demonstrated by the ongoing population growth and declines in food production. In recent years, Pakistan has seen a rise in both planned and voluntary migration as well as unplanned and forced displacement. Pakistan's varied topography, urbanization, industrialization, and increased usage of natural resources make it vulnerable According to AQI (2023), Lahore has officially emerged as the city with the poorest air quality worldwide. Smog has turned into a "fifth season" in Lahore. All Pakistani cities have dangerously high levels of air pollution, according to data gathered by air quality sensors. Lahore has gone nine times over the safety limit today. Burning crops, burning coal, and emitting diesel and other industrial pollutants are the main causes of air pollution. The inversion layer of temperature, which is closer to the ground, traps harmful particles. In all seasons, but especially in the winter, this pollution growth has become a health hazard (Rehana, 2017).

Hospital admission rates are rapidly rising because of air pollution. Children should stay indoors and not go outside to play, according to doctors. The absence of awareness talks is one of the main problems. Most people constantly wear anti-pollution masks due to air pollution. avoid class because of the poor air quality. Air pollution has a negative impact on Pakistan's economy in addition to health. In Pakistan, the financial cost of air pollution amounts thurtso approximately 6% of GDP. Smog in Pakistan is a catastrophe rather than an environmental problem. Pakistan's air quality has now exceeded the safe thresholds. Compared to national norms, the situation in Lahore is nine times worse. An estimated 135,000 people die each year because of air pollution. It is the main cause of illness and death in Pakistan. Additionally, it causes Pakistan's life expectancy to drop by 60 months. Smog is more than simply air pollution these days. Indeed, a public health emergency has occurred. Practical implementation of this public health emergency is urgently needed, in addition to sensible policy suggestions from pertinent parties. Building capacity is the only way to make better decisions. The public has the right to demand clean air. Air pollution causes serious health issues, such as heart and lung disorders and respiratory difficulties. (Omer, 2018). In a similar vein, food prices have gone up. Pakistan's governance structures are under threat from climate change. Pakistan's government is currently having difficulty providing for even the most basic of its citizens' requirements. In Pakistan, social tensions are increasing (Naseem et al., 2021).

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CJSSR
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Vol.04 No.01 (2026)

Climate Change as a Threat to National Security

According to 70% of countries worldwide, including Pakistan, climate change is becoming a national security concern. When it was introduced in 2013, the Pakistani government even developed a thorough National Climate Change Policy (NCCP) that established all the standards (Fahad & Wang, 2020). It is clear from the events occurring all over the world that climate change poses a serious threat to our national security and has the potential to spark national disintegration (Khan et al., 2021). Naturally, the issue is raised: Could climate change lead to Pakistan's destabilization? Could food shortages have brought on by the frequent floods and droughts spark riots and perhaps a revolution, like the Arab Spring which was sparked by high food prices brought on by drought? Experts think Pakistan can learn from the tumultuous mix of underlying causes that exploded into revolution in Tunisia and Syria, where the effects of climate change were stresses, Pakistan does not have a national adaptation plan. The three main areas of disaster management, health, water, and power, require a well-equipped government office or an institutional structure to coordinate initiatives related to climate change. (Martínez-Moreno et al., 2022).

In 2010, Pakistan had the most devastating floods, which prompted the concentration It was subsequently determined that the unusual monsoons in the North were the cause of these floods. In addition to causing thousands of individuals to become climate refugees, the 2010 floods cost the country's economy an astounding $9.7 billion in damages (Khan et al., 2021). Nine out of ten of the most significant disasters in the last four decades have been caused by climate change (Shabbir et al., 2020). Because to the effects of climate change, Pakistan's national security is more vulnerable than ever. Another important factor that cannot be ignored is the harm it is doing to the country's economy and the amount of attention and material resources that the government and military devote to it annually. Numerous regions in the north, such as Chitral, are susceptible to landslides and glacier floods. Similar problems include rising temperatures, unpredictable rainfall, and decreased agricultural output in Punjab and Sindh's agricultural belt, while soil erosion and water scarcity are prevalent problems in inner Baluchistan. The most crucial industry in Pakistan has been determined to be water. The military is one of the primary stakeholders in Pakistan when it comes to climate change issues that arise about national security, therefore it is excellent that they are becoming aware of the concerns posed by this phenomenon. Climate change will undoubtedly become a significant security concern in the future. (Khan et al., 2021).

Intensification of Climate Change as a Nontraditional Security Threat

An unconventional security threat is now climate change. To address common environmental risks, states are creating policies. We must comprehend the effects of growing global warming as well as how to survive in a contemporary, technologically advanced environment. Power politics or traditional security threats, whether they come from within or beyond, are characteristics of modern states. However, climate change is a phenomenon that transcends national boundaries and has the capacity to impact any state or country. National security is significantly impacted by climate change for several reasons. Since a state's territory is a component of "national security," any physical alteration to it is viewed as a danger to the nation's sovereignty. Geographical position also affects national security, particularly security that is at risk due to sea level rise and glacier melting. The concept of national security is complex. Its internal dimensions hold significant significance. According to Hassan Askari, "the major categories of security are terrorism and extremism, links between external and internal security, soft power and influence, exterior or territorial, internal, societal and human security or the Nation of holistic security" (Askari, 2022).

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

The idea of security has been expanded in the contemporary setting, and security risks have increased due to non-traditional threats. For instance, "economic and commercial costs are among the effects in the wake of climate change" (Global commercial Policy Council, 2021). In certain instances, the losses are substantial enough to support the claim that climate change poses a threat to economic security. All the state's potent components population, military, intelligence capabilities, social variables, and behavior may be impacted by climate change (Methew, 2011). More than 150 soldiers were stranded when an avalanche struck the Pakistani garrison at Glacier, Siachen, in 2012. This episode demonstrates the incapacity of the contemporary military to handle these difficulties. An inhospitable environment on land, in the sea, or at glaciers might lead to a serious national catastrophe. The planet's natural ecology has been drastically and alarmingly altered by industrial development, advanced technology, population increase, and poor resource management in developing nationsfor the survival of both the state and society. Human security is being threatened by climate change. The values of communities and the public are greatly impacted by environmental issues like climate change (Methew, 2011)

During the recent flood calamity, those who relocated from Southern Sindh to Balochistan engaged in criminal activities; young girls were kidnapped and transported from Sindh to Balochistan. During both natural and man-made disasters, we have observed a rise in criminal activity, the emergence of criminal gangs, and a decline in human security. The entire country and state are at serious risk from climate change, and a poor nation like Pakistan cannot quickly address these "natural disaster" issues. The UN High Commissioner for Refugees issued a warning in 2008 about the threat of widespread displacement brought on by climate change. According to the Global Humanitarian Forum (2019), people are impacted by climate change in a variety of ways. First, food security, which highlights how hunger among the impoverished and children has been caused by lower agricultural output, low animal production, and limited seafood providers in places affected by climate change where the ecology has degraded. Second, health issues have a significant impact on society.

With rising levels of carbon dioxide, water vapor, and other pollutants, pollution is also a global problem that has altered the climate. The Antarctic and Arctic ice caps would melt due to climate change, raising the sea level by 100 meters. There are major existential risks from glacier melting and tsunamis. A recent study found that Pakistan's glaciers are melting and are now the main source of the country's severe summer floods. Unprecedented heat waves are causing the Himalayan and European Alps' glaciers to melt. As the Arabian Sea warms, glacier melt intensifies the intense monsoon and precipitation. The climatic record is highly fragmented and untrustworthy, and climate change is naturally and increasingly variable from place to place. High-range floods brought on by climate change in the past have even changed land maps due to sea level rise, forcing people to migrate The Indus River in South Punjab uprooted many people and devastated a vast area of infrastructure, orchards, and crops in 2010.The Indus River in South Punjab uprooted many people and devastated a vast area of infrastructure, orchards, and crops in 2010 (Rafiq & Blaschke, 2012).

This damage altered food production and raised concerns about national security. The Suleman Mountain Range was the primary source of the severe floods in South Punjab in 2022. during 100,000 people were impacted by the strong monsoon rains that occurred during the previous four years, which also damaged 4,000 homes and ruined over 200,000 acres of crops in Dera Ghazi Khan and Rajanpur. The majority of Balochistan was also severely impacted by the flood in 2022. This province experiences both natural and man-made disasters, such as the flood in 2022, which primarily affects Balochistan's poverty. Mud dwellings, cattle, crops, bridges, and other communication and transportation infrastructure were all carried away by

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CJSSR
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Vol.04 No.01 (2026)

the flood. The threat to food security intensified because of Balochistan's isolation from the rest of the nation. In addition to destroying communication and transportation facilities, the floodwater carried away entire or partial mud houses, cattle, and crops (Javad, 2022). Lieutenant General Sarfraz Ali, who oversaw the flood relief effort in Balochistan, lost his life along with his crew during the flood. When citizens in Pakistan are stranded or experience any form of disaster, the army comes to their aid. Concerns and questions have been raised by Flood 2022 for both provincial and federal officials. Some areas of Sindh were severely damaged by the devastating flood, and residents there faced similar difficulties and problems as those in Punjab, Balochistan, and KP. However, the Sindh government failed to provide adequate aid to the populace, which led to protests and agitation. As a result, the Supreme Court of Pakistan stepped in and requested that the provincial government furnish specifics regarding relief and management in Sindh. According to Chief Justice Umar Atta Bandial, "the flood issue is a fundamental right of the people rather than a matter belonging to the administrative authorities" (Chaudhary & Clark, 2022).

Floods and Droughts in Pakistan

Water resources and water security would suffer because of climate change, because to extraordinarily strong monsoon rains in 2010, the nation had one of the worst floods in its history. The incident affected about 20 million individuals and resulted in almost 2,000 deaths. In decreasing order of severity, the following other years saw significant flooding in the nation: 2015, 1983, 2011, 1976, 1997, 1994, and 1992. Punjab's 120 million residents, 48 million, or 38% of the province's total population, reside in high-risk flood zones. Rising temperatures have also made droughts more frequent and severe in Pakistan. Future droughts and floods will be more severe, which will have an adverse effect on water supplies. The World Resource Institute estimates that between 2010 and 2030, Pakistan’s population at risk of riverine floods will rise from 1.9 million to 5.2 million, the country’s GDP will drop from $4.6 billion to $22 billion, and the amount of urban property damaged by riverine floods will rise from $1.6 billion to $9.3 billion.21 All emission paths are predicted to increase the likelihood of meteorological drought, and these increases will be quite significant. (Rizwan, 2023).

The 2022 floods: A case study

A third of the nation was submerged by devastating floods in 2022, which primarily affected the provinces of Sindh and Balochistan. According to the government's damage assessment report, the floods killed 1,739 people, damaged around 33 million homes, and caused $14.9 billion in damages and $15.2 billion in economic losses. The recent flood in 2022 is only one of 150 extreme weather events that Pakistan has experienced over the past 20 years (Pakistan’s Battle against Climate Change - Pakistan, n.d.). Water that has not yet evaporated in some areas of Sindh covered one-third of the nation. The worst flood in Pakistan's history occurred in 2022. The latest flood was brought on by an abrupt increase in precipitation and a rise in the rate at which glaciers are melting because of rising temperatures. The National Disaster Management Authority (NDMA) reports that this year's rainfall in Pakistan has exceeded average by 133%. The seasons are changing in Pakistan as well. Pakistan's winters are getting warmer, and this trend will only become worse with time. The length of the spring season has dropped by 25% (Shorter, Hotter, earlier: Shrinking Spring Slashes). Pakistan | Relief Web, n.d.; Pakistani Harvests. Pakistan's summer season has grown from 8% to 10% annually, which is a concerning rise. Additionally, it has been predicted that Pakistan will only experience two seasons soon, which will cause the country's agriculture economy collaps (shabir,2023)

According to some projections, Pakistan's agricultural productivity may drop by as much as 9 to 11% until 2040 because of this abrupt climatic change (climatic Change Killing

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

Agriculture, 2022). The torrential downpours triggered flash floods and landslides that destroyed entire villages, damaged roads and other infrastructure, and ruined crops. In many places, the quantity of rainfall exceeded Pakistan's typical summer monsoon by a factor of several. The floods of 2022 followed the 2010 floods in Pakistan, which killed between 1,700 and 2,000 individuals and affected an estimated 20 million more. Meteorologists and climate specialists claim that the consequences of climate change associated with global warming boosted the volume of seasonal runoff from melting mountain glaciers, exacerbating the flooding. In Pakistan, there are over 7,200 of these glaciers. Scientists claim that since the late 20th century, increased average regional temperatures and an increase in the frequency of heat waves have caused some of Pakistan's glaciers to melt earlier in the season and to decrease overall. Before the monsoon arrived, Pakistan had record high temperatures of above 50 °C (122 °F). (Aslam et al., 2024)

Causes Of Flood

The disaster's primary cause was linked to exceptionally heavy monsoon rains intensified by the formation of two atmospheric rivers, which directed moisture into Pakistan throughout July and August 2022. The monsoon rains play a crucial role in providing water for agricultural irrigation, replenishing groundwater, and serving as a working fluid for the country's hydroelectric power stations. Normally, Pakistan receives about 70 percent of its total annual rainfall in July and August; however, during that time in 2022, the rainfall amounts were nearly twice as high. In the provinces of Baluchistan and Sindh, the rainfall totals were approximately 4.5 times greater than usual. The flooding was further exacerbated by seasonal runoff from melting mountain glaciers, the flow of which, according to meteorologists and climate scientists, was heightened due to the impacts of climate change related to global warming. There are almost 7,200 of these glaciers in Pakistan. Many of Pakistan's glaciers are melting earlier in the season and diminishing overall, according to scientists, as average regional temperatures and the frequency of heat waves have increased since the late 20th century. The Indus River and its tributaries, which were already overflowing from torrential rains, received more meltwater than typical before the monsoon arrived due to a stretch of record high temperatures in Pakistan that exceeded 50 °C (122 °F).

Damages Caused by Flood

Pakistan was already facing the economic consequences of unprecedented inflation and the lasting impacts of the COVID-19 pandemic when the calamity occurred. In August, government officials announced a state of emergency as flooding reached its highest level, affecting around 246,000 square km (95,000 square miles) an area comparable to the size of West Virginia. The water isolated remote villages, making rescue and relief operations more difficult. From June to November 2022, at least 1,739 individuals lost their lives due to flood-related incidents. Out of the 33 million individuals impacted by the flooding, almost 8 million abandoned their residences, and over 20 million required humanitarian assistance, with about half of this figure experiencing severe food scarcity. Six months post the waters' receding, the government approximated that nearly 2 million individuals continued residing close to polluted stagnant water. Malnutrition, which was a worry prior to the flooding, particularly among children, rose in the community the next year. Numerous regions that suffered the greatest destruction from the floods previously faced significant food insecurity, restricted water access, inadequate sanitation, and low school participation. Malnutrition heightens vulnerability to waterborne illnesses, such as cholera, malaria, and dengue, with cases of all these diseases being reported in the country by October. (Mustafa & Ahmed, 2023).

The flood had far-reaching economic consequences. The affected infrastructure comprised schools, communication networks, public health centers, approximately 13,000 km (around

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

8,100 miles) of roads, and over 400 bridges. With crops devastated, fields submerged, and over 1.2 million livestock lost due to the flood's impact, farmers faced an entire season of agricultural failures. Moreover, numerous water systems in impacted regions were also harmed, compelling individuals to source drinking water from untreated ponds and wells, which increased the likelihood of exposure to waterborne illnesses The worldwide scientific community responded to the floods with anger. The rise of natural disasters in the 21st century is impacting socially vulnerable nations such as Pakistan, which produces under 1 percent of global greenhouse gas emissions. However, due to its geographic position, weak infrastructure, significant poverty levels, and extensive glacial ice, it is experiencing the severe consequences of climate change. Pakistan, specifically, faces some of the greatest disaster risks globally, stemming from both natural calamities and armed conflicts

The Drought Crisis: (2024-2025)

In Pakistan's history, the winter of 2024–2025 has been among the driest. The Pakistan Meteorological Department (PMD) reports that the nation has seen an astounding 67% decrease in rainfall compared to normal. Punjab, the agricultural heartland, witnessed a 69% drop in the deficit, while Sindh, the hardest-hit province, recorded a 90% shortfall. A severe lack of irrigation water has resulted from this low rainfall, especially in rain-fed areas where farming is totally dependent on seasonal precipitation. Farmers are preparing for large losses as crops, including wheat, sugarcane, and lentils, wither. Pakistan got rainfall in December 2024 that was 88% below average, with a countrywide average of only 1.6 mm. The localized and irregular nature of precipitation was highlighted by the fact that Kalam (KP) recorded the highest monthly total at 33.0 mm, while Mirkhani (KP) received the heaviest daily rainfall of 25.0 mm. In general, the temperatures were lower than usual. At 12.27 °C, the national average was somewhat lower than the average of 12.77 °C. The average temperature during the day was 20.03 °C (−0.22 °C anomaly), while the average temperature at night was 4.5 °C (−0.35 °C anomaly). Skardu (GB) experienced the coldest night at -13.2 °C, while Gwadar (Balochistan) recorded the hottest day at 33.5 °C. The vast climate variance throughout Pakistan's varied terrain is reflected in these temperature extremes. The patterns of the worldwide climate had an impact on these situations. With the Indian Ocean Dipole tilting slightly negative and the Pacific Ocean temperatures reaching -0.6 °C, the ENSO has moved into La Niña, causing cooler and drier weather throughout a large portion of the nation. (Sarwar & Farid, 2025)

These changes in the factors influencing the global climate have an impact on the region's water supplies, agriculture, and preparedness for disasters in addition to the monthly weather. Most areas continued to be dry, and the northern alpine regions had little snowfall. This sparked worries about the diminished snowpack and how it would affect the supply of spring water. Rain-fed farmers reported lower soil moisture and delayed sowing. Additionally, urban areas experienced higher dust concentrations and drier air, which exacerbated health issues. While the IOD stayed in its neutral phase, ENSO conditions remained weakly La Niña, providing rainfall in March 2025 was marginally better than in previous months, but it was still below average overall, with national area-weighted rainfall of just 15.1 mm (-50% anomaly). Concerns regarding the early development of heat stress were raised by the intensification of dry and warm conditions in the Central and Southern areas. Higher-than-normal temperatures in agricultural zones boosted crop growth but also raised the need for irrigation. Many regions of the country continued to experience drought-like conditions, even if the North saw some rainfall. Minimal assistance for weather systems that are high in moisture. (Malik, Ashraf, & Murtaza, 2023).

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

Water Scarcity and National Security

In 2010, the "Task Force on Climate Change" identified a few threats and consequences of climate change that affect water security. These consequences include River flows have become more irregular because of the disappearance of glaciers and the increased unpredictability of winter and monsoon rainfall. Higher evaporation rates at higher temperatures, which follow declining per capita water resource availability and rising overall water demand, resulted in an increase in the demand for irrigation water. Increased silt flow brought on by more frequent heavy rainfall accelerates the loss of reservoir capacity. Increased occurrences of Glacial Lake Outburst Floods (GLOFs) and high-altitude snow avalanches caused by tributary glaciers that surge and choke core valleys. Inadequate knowledge and modeling skills regarding glacier melting and rainfall patterns, as well as a lack of up-to-date data and monitoring efforts on the effects of climate change in various places. In Pakistan, water has turned into a major source of contention. Pakistani agriculture depends heavily on water, and any decrease in the amount of water available lowers agricultural output. Over-reliance on the Indus River suggests that the nation will have to deal with disputes with other countries over how to use the river's water. (Boas & Rothe, 2016)

According to projections, Pakistan will experience a 30% rainfall deficit by 2030, which will lower agricultural yields. The nation will face significant job losses, force migration, and increasing urbanization because of the loss of arable land and decreased agricultural activity. The climate change time bomb is ticking for Pakistan, where the expanding population is already being raised on meager resources. Conflicts can be exacerbated by environmental migrants' food and energy stress, which can result in the fight for social acceptance, political power, and ethnic identity. Social and communal conflicts are still likely to occur when the native population must contend with environmental migrants for limited water and agricultural resources. The stability of Karachi, a coastal metropolis, was in danger due to rising sea levels. Seas and ocean levels are rising because of melting glaciers and the increased amount of water in the ocean brought on by climate change. The occurrence of floods is intimately linked to sea level rise. Without prevention and management, the effects of climate change would alter Karachi's demographics and may play a significant role in the establishment of a new political system. The patterns of the world's weather have been hurried into chaos by global warming and the resulting climate shifts. Large-scale tree planting campaigns, sensible urban planning, the implementation of reliable flood control plans, and the building of water storage reservoirs can all assist in mitigating the negative effects of climate change. **(**Ahmad & Afzal, 2020).

Environmental Security and Ecosystem Degradation

Changing Weather Patterns: According to the Pakistan Meteorological Department, the country's overall monsoon pattern has shifted 100 kilometers to the west during the past 30 years due to climate change. Seasonal variations also occur in the patterns of rainfall distribution. The winter showers have moved toward late February and early March, just as the summer monsoon has moved toward the conclusion of the term. During the monsoon, some intense rainfall in the metropolitan area causes urban flash floods. Due to the Arabian Sea's warmer temperatures, tropical cyclones often form in the Bay of Bengal in South Asia, however during the past 20 years, this pattern has begun to shift. Climate change is to blame for the Arabian Sea's rising temperatures, which are now almost equal to those of the Bay of Bengal. One of its effects is the formation of depressions, which are created in places with low pressure. They have the potential to develop into tropical cyclones and are likely to impact the coast of Sindh and Makran. Rainfall may be occurring less frequently, but its intensity is on the rise. (Chaudhry & Hassan, 2022).

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

- **Glacier Melting:** With over 7,000 well-known glaciers, including roughly 543 in the Valley of Chitral, Pakistan has more glacial snow than any other place on Earth outside of the Polar Regions. The water from these glaciers flows into the rivers, providing roughly 75% of the country's stored water supply to its 180 million people. However, scientists say that, like in other countries, Pakistan's glaciers are vanishing, especially those at lower elevations, such as the Hindu Kush Mountain region in the north of province. Experts cite several factors, including increased temperatures, heavier summer showers, and widespread deforestation. Tree roots stabilize or bind the glaciers to the ground, and Pakistan is losing its tree cover at a startling rate.
- **Rise in Temperature**: A rise in atmospheric carbon dioxide raises the temperature, which influences precipitation and moisture levels. Pakistan is among the lower-altitude nations that experience output losses because of rising temperatures, even though high-altitude nations may experience higher rainfall and higher productivity.
- **Soil Erosion**: Of the various ecological threats Pakistan faces, soil erosion seems to be the most serious. The loss of soil at the surface level, which conveys rich soil due to strong winds and running water, is known as soil erosion. Soil erosion is happening at an alarming rate in the Northern regions because of deforestation. On steep hills like the Potohar route and nearby areas, which are frequently used for farming, water erosion is evident. An estimated 150–165 tons of erosion per acre per year is the largest amount that has been observed. Some assessments claim that the Indus is dumping 500,000 tons of silt into the Tarbela Reservoir every day, reducing the reservoir's volume by 16% and the dam's lifespan by 22%. Water erosion has a greater impact than wind erosion. The combination of the two, however, is more unsettling. This reduces the land's annual output by 1.5-7.5%. (Iqbal & Raza, 2022).

Impact of Climate Change on Pakistan's Agriculture Field

Climate change is now becoming a major issue for Pakistan, and its national security as well as the general stability of the country are greatly impacted by climate change. The geographical location of the country, its dependence on climate-related industries like water resources and agriculture, makes it very sensitive to environmental changes. The frequency and intensity of rising temperatures, changing rainfall distributions, melting of glaciers, and extreme weather events such as floods, droughts, and heat waves have been on the rise, posing severe threats to livelihoods, infrastructure, and economic growth. Climate change in Pakistan is multidimensional since it has consequences on human security, economic stability, and social cohesion. Water scarcity, soil degradation, and unpredictable weather conditions cause the agricultural sector, which sustains a high percentage of the population, to suffer great losses. Likewise, water resources are being pressured by the fluctuation of river flows and reduced availability, raising concerns about water security. Damage to infrastructure due to flood and other catastrophes disturbs transportation, communication and other basic services and comes at a high economic cost.

These issues are associated with food insecurity, increased poverty and unequal resource distribution, especially to the vulnerable communities in the rural and underdeveloped areas. Social and demographic pressures are also aggravated by climate change, especially by climate-driven migration. Floods, droughts, and environmental degradation lead to displacement of people, which results in migration of people to urban areas, putting pressure on the urban areas and creating a competition among people regarding the available scarce resources like housing, employment, and basic amenities. In other instances, cross-border migration can also be possible,

ISSN E: 3006-1466
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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

complicating regional relations. Such population flows may help provoke social tensions and bring out preexisting inequalities, particularly where governance mechanisms are feeble and incapable of effectively responding to increasing demands. In sum, climate change is a threat multiplier in Pakistan, which influences existing economic, social, and environmental vulnerabilities. Its effects do not just affect the environment but also the stability of nations through impacts on livelihoods, scarring of resources, and straining state institutions.

Findings

Rising Climate-Induced Disasters

Pakistan has experienced an increased frequency and intensity of climate-related disasters over the past five years, including floods, droughts, heatwaves, and cyclones. Major floods in 2022 and 2023 caused extensive damage to infrastructure, disrupted supply chains, and displaced millions of people. These events not only strained government resources but also created vulnerabilities that can be exploited in contexts of social unrest, highlighting a direct link between environmental change and internal security challenges**.**

Water Scarcity and Regional Tensions

Water resources in Pakistan are under mounting pressure due to changing precipitation patterns, glacier melt, and mismanagement of rivers and reservoirs. The Indus River Basin, vital for agriculture and energy production, faces seasonal variability that threatens irrigation systems and hydroelectric generation. Reduced water availability has contributed to inter-provincial tensions and may exacerbate disputes over shared resources, both domestically and with neighboring countries, thereby posing strategic risks to national security.

Socio-Economic Vulnerability and Migration

Climate change-induced disruptions have increased economic insecurity, particularly among rural and low-income populations. Crop failures, livestock losses, and reduced income opportunities have forced significant internal migration from rural areas to urban centers. This migration places pressure on urban infrastructure, housing, and social services, creating potential flashpoints for social unrest. The cumulative effect is a heightened vulnerability of communities, which may weaken national cohesion and resilience.

Conclusion

These days, climate change crises are real, and Pakistan is especially vulnerable to them. It is a fundamental issue that affects the country's security, well-being, and economic stability, in addition to its environment, and quick and comprehensive action must be taken to protect the Pakistani people and their future from this growing threat. Pakistan's only options are to use its natural resources responsibly, prioritize protecting its coastal ecosystems, adopt a realistic strategy to reach net-zero emissions with achievable short-term goals, and integrate climate change concerns into plans for national security and cooperation with international partners in green investment. There are currently 200 million people living in Pakistan, but that number is expected to rise quickly, potentially reaching 400 million or more by 2050. It can be extremely challenging for a nation with limited financial means and environmental vulnerability to deal with such a severe population crisis. Climate change can upend Pakistan's political system and destabilize the nation. Food insecurity, energy shortages, and water scarcity all contribute to anarchy. Considering these factors as well as the dangers of terrorism, extremism, and radicalization, Pakistan demands that corrective action against climate change and global warming be planned and put into action right away. Pakistan is attempting to join the group of nations that have identified themselves as major actors in the fight to reduce carbon emissions by implementing a climate change policy that makes the issue a priority agenda.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

Pakistan is facing several issues because of climate change, including threats to its national security. The most devastating flood in Pakistan's history recently damaged both persons and property. In Pakistan, floods frequently occur, resulting in land erosion, the devastation of thousands of acres of crops, and the deaths of both people and livestock. Pakistan is at risk from heavy rains during the monsoon season. In Pakistan, heatwaves are now frequent occurrences that claim numerous lives. Coastal towns like Karachi and human settlements close to the coast are also in danger due to sea level rise. The world has been impacted by the phenomenon of climate change, which has had multiple effects on state security. Pakistan is not an exception. Although the government has released its climate change policy, the matter is far from over. Since everyone is concerned about national security, all institutions, from the military to business and social sector organizations, must express this worry and work to align. The issue can be effectively resolved by putting the policy into practice, creating think tanks to research climate change, and identifying strategies to stop this threat. The actions discussed in the preceding paragraphs are merely things to consider in this situation. Professionals can, of course, present more practical solutions when they get together.

Recommendations

- Considerable expenditures in the water, sanitation, and health sectors should be made to secure international assistance in handling the consequences of urban flooding. Capital expenditures are needed for desalination and wastewater treatment; municipalities should contract out these services using public-private partnership investment models.
- Whenever feasible, natural solutions should be given priority. Natural flood barriers can be produced by mangrove ecosystems and wetland recharge programs. In regions where financing for green programs has been reduced, the provinces can benefit from pre-existing carbon sinks, as demonstrated by Sindh's efforts to replace and expand its mangrove cover.
- The National Disaster Management Authority (NDMA) should create a thorough Disaster Risk Management (DRM) Framework that incorporates preventive, preparedness, response, and recovery activities.
- For DRM implementation to be successful, the institutional capacity and coordination between pertinent government agencies, civil society groups, and the commercial sector should be improved.
- To improve readiness and reaction capabilities, investments in warning systems, technology, and infrastructure should be promoted.
- To strengthen local communities, community-based disaster risk reduction programs ought to be supported.
- Pakistan needs regional and international cooperation to address climate change, which is a transboundary issue, to acquire best practices and obtain resources for disaster risk management.
- Given that climate change is a major danger multiplier, an integrated national security plan that takes it into account is required. To guarantee that national security policy is implemented effectively, the plan should provide specific actions for every climate-related risk. A framework for climate diplomacy should be created to interact with both domestic and foreign players. Best practices for promoting global climate action should be incorporated into this framework.
- Pakistan should integrate climate-sensitive strategies into conflict resolution attempts to address environmental challenges and disputes fueled by resource shortages. It is

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.04 No.01 (2026)

important to support peacebuilding initiatives and hold talks that include how climate change affects security dynamics.

- To exchange information and make well-informed decisions, bilateral and multilateral partnerships with regional government and nongovernmental organizations should be encouraged.

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