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The Impact of Climate Change and Floods in Pakistan: Challenges and Way Forward

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Abstract

The study delivers a deep analysis to scrutinise essential notions regarding causes, impacts, and challenges of climate change. Pakistan is considered one of the top five countries vulnerable to climate-related problems. Climate change has become one of the major reasons worldwide. The worse metrological conditions include various natural disasters such as abrupt increases in temperature, deteriorating precipitation patterns, and rapid glacier melting. One of the greatest dilemmas is that climate-induced floods have escalated in regularity and intensity, paving the way for massive complications to the social, governmental, and economic systems of Pakistan. Frequent torrents led to loss of human lives and grievous harm to infrastructure. The qualitative research is used to conduct this research. In conclusion, floods are unrestrained, but their effects can be overcome through resilient planning and strategies, good infrastructure, and reforms. The government of Pakistan must associate national advancement with meteorological dimensions and mitigate the impact of climate change.

Keywords: Environmental Disaster, Flood Impacts, Policy Response, Monsoon Rainfall

Introduction

Temperature change has become a worldwide issue that adversely influences the whole planet. All states, whether independent or dependent, are facing and dealing with the danger posed by the rapidly changing weather patterns. The unexpected transformation in the atmosphere has made it a matter of huge importance. Environmental modifications granted even a limited time for species to adapt to sudden climatic conditions. Consequently, the residents of the peculiar societies have bad effects on culture and living, way of spending life, and advancement, whether in advanced countries or underdeveloped countries. The people who are poor and live in rural areas with miserable surroundings are the targets of it. (Akram et al., 2025) Microclimate disadvantages appear in the guise of high temperature, extreme variations in weather, floods, dearth, heavy drizzle, and extraordinary slick of sea, and destruction of the agricultural sector. It is also a rising danger of loss of lives of species living in the oceans. It deteriorates the system of connection and communication among individuals and the catastrophe of refinement and cultural outlines. (Jan et al., 2021) The main dynamic actions that are performed by humans are contributed in the exaggeration of the effects of climate change.

Those consist of the extensive use of conveyance, resulting in great greenhouse gas emissions. This phenomenon was coming into emergence after the mid-20th century. According to the proofs and evidence carried in the form of a document known as the Fifth Assessment Report, the events that affect society from central aspects have been endangered. The augmentation of scarcities, extreme heat waves, and tidal waves has become an existential threat. The roads, buildings, shops, and vehicles, as well as creatures, are about to be destroyed mainly due to complications emerging from climate fluctuations. (Khan et al., 2022) It is greatly anticipated that if the issue does not come under control even after the precautions and measures taken by the government and experts, its impact will be elevated, and it could be difficult to overcome and adapt to those deviations with the passage of time in the period of cultivation and progress (Jan et al.,2021). Mainly in this century, the monsoon has increased more than before. The unpredictable floods and famines in agricultural land have turned the lives of people into danger (Mahmood et al., 2021).

Although it is dominated over the world, South Asia is the most vulnerable and particular region welcoming death-trap environment-related problems (Adu et al., 2017). Pakistan is a developing country that faces earthquakes, hurricanes, and other dangerous disasters. The survey shows that Pakistan's 40% land is a victim of floods (Messner et al., 2016). The regions that deal with extensive floods are facing human life losses and huge economic collapse. In simple words, it is dangerous for both personal and professional lives of people living in the country (Aziz et al., 2021). The people of Pakistan every year, in the largest number of consequences of floods that come to the realm. The downpours disaster occurred because of the result of windstorms and droughts instigated by the Bay of Bengal exclusively in July and September. Pakistan's two provinces, that are Sindh and Punjab, are cripplingly influenced by the huge floods. The poor climate and the problems driven by it are major reasons for Pakistan's increasing issues of overflows (Abbas et al., 2021). The study and literature show that Arctic areas are closer to belongings of weather adjustment than those of Southern districts. The thrilling and impulsive upsurge of disorder has contributed to the unforeseen melting of glaciers of Karakoram and Himalayan (Nadeem et al., 2022). From 2010 to 2015, Pakistan was swiftly affected by floods. (Kreft et al., 2013) Pakistan was one of seven countries that become victim of climate change.

Literature Review

The individuals, political, economic, and social systems of Pakistan are seriously affected by the hasty ups and downs in the weather patterns. Almost 796000 km2 of the topography of the nation triggers the prompt growth of heat, immediate snowfall, and violent configurations. Pakistan, being an evolving state, and its other western parts and polar expanses practice wide-ranging precipitation mainly in winter. The rainy spell lasted for five months. In contrary of these constituencies, the eastern parts are obstructed unpleasantly by the wet season happening in the summer season that exists for four months, principally from June to September. But the country's southern and northern areas experience substantial hails 760 to 2000millimeters. (Iqbal & Lodhi.2014). The report of IPPC, known as the Fifth Assessment Report, states that the countries most affected by agricultural growth, particularly economically, face more challenges because they are unable to effectively address poverty mitigation, even at lower levels, due to disasters driven by climate change. (Kundzewicz et al.,2014) The current evaluations present that the South Asia region will be warmer than other areas of the ecosphere. The heat waves will cause the rapid melting of glaciers, which will eventually lead to floods. The factories and major industries that are unquestionably contingent on resources of water will have gigantic possibilities to be pretentious because the manufacturing and proficiency of businesses and trades are also declined unpleasantly mainly throughout rainy period (Pervaiz Amir & Habib, 2015). Pakistan is a rising country, and it has innumerable resources, but the government is not able to use them effectively. Pakistan's 70% economy is based on agriculture. The quick dynamics of Monsoon rainfalls and the arbitrary precipitation cycle will desperately provoke the threat to poor crop production, including the constraint of water for irrigation. The appropriate portion of population heavily hinge on agriculture consider it a major

root for earning, added to miseries and poverty, leading to difficulties for poor people. Due to the worse waves of the federation. Pakistan is suffering from many snags including profitable, shared and dogmatic aspects that involves poor statuses and limitation of different resources. The 50% of the whole inhabitants of Pakistan are under poverty line. The gracious economic and social structure of Pakistan further increases the troubles of individuals and the government of Pakistan due to the intensification of climate change (Caimotto, 2022). One of the federating units of Pakistan, which is filled with a far-reaching quantity of natural resources, is Balochistan. The hill and the river that remained the cause of dispute in the Indus Basin are the topographic attributes in southern. This tributary, which consists of 65% of the geographical landscape, is the sole part of the irrigation structure of the Indus Canal. This is considered the prevalent scheme of irrigation across the global village. 230 millimetres of rainfall annually is experienced by the Indus plain (Arias-Carrera et al., 2019). When the temperature spikes from the normal magnitude, it will prove more dangerous for emerging countries than established states because almost all the third-world countries are hooked on farming and consider it their main income source. When implications of ecological shifts are amplified, it will directly to the crops. Culminating in the lack of construction of nutrients for the survival of residents and shrinking income, destroying the economy of the nations. (Reilly, 1995) The abrupt changes in environmental phenomena substantiated these natural disasters all across the world. The random events that transpired in it are given the idea in the form of rising sea level, temperature, sudden changes in weather patterns, glaciers, deficiencies, floods, and cyclones, etc. These are the aftermaths of the extraction of harmful greenhouse gas emissions and Co2, disrupting the weather of Pakistan. Gases are always the hardest reason that demonstrates injury. Human deeds also show a significant role in the enlargement of waves that escalate troubles for the realm, including the living and non-living mortals on Terrain. (Climate Change, 2009)

Research Objectives

- To examine the effects of climate-induced floods on the lives of citizens and the socioeconomic advancement of Pakistan.
- To analyse the policy reforms and certain initiatives introduced by the government of Pakistan to overcome frequent and severe floods.
- To suggest measures to mitigate the natural disasters caused by abrupt changes in environmental patterns in Pakistan.

Research Questions

- How have the climate-driven dilemmas impacted Pakistan?
- How do the hydro-climatic floods spark calamities in various areas?
- Which cautionary and defensive actions has the government of Pakistan embraced to evade climate devastation in the near future?

Research Methodology

The research paper employed a qualitative approach in order to analyse the implications of floods and climate change in Pakistan while concentrating on complications originating from it. Both secondary and primary sources were used in the study. Secondary information was gathered through an extensive review of existing literature involving various research articles, academic journals, and multiple reports, including the Planning Commission of Pakistan (2007) and the Annual Flood Report (2017). Primary data was compiled through official government publications. It incorporated a descriptive overview of gathered data, mainly focusing on environmental challenges and key strategies for addressing the crisis of climate change in Pakistan.

Causes of Climate Change in Pakistan

There are a large number of motives of climate related changes in Pakistan. One of them is the reliance of the

country on non-renewable sources of energy. These are used for generation purposes in the energy and power zones. This comprehensive practice consistently results in the discharge of injurious and detrimental bodies into the atmosphere. Numerous other dynamics also contribute to this situation. A major chunk of the general masses has budged from villages into the cities, the consumption of power has progressively enhanced mainly due to technological developments, and the increase in the usage of private individual cars are the unfavourable contributors to carbon dioxide release, eventually triggering climate change (Elshafei, 2022). Among the eight South Asian countries known as SAARC, the key state for the emission of gases contributing to the greenhouse effect is Pakistan. Due to this, various regions of the country face a grave intensification of temperatures (Abas, Kalair, Khan, & Kalair, 2017). The emerging states are facing extreme concerns predominantly due to fluctuating weather conditions as compared to the industrialized countries. The main aspect behind this case is that the public of unindustrialized nations is deprived of consciousness and sentience. The citizens of these states have an inadequate capability to respond to such situations. All the above-mentioned factors are playing their crucial role in making the country responsible for the emission of an enormous level of carbon dioxide. Due to these changing climate patterns, the country is dealing with an increasing number of issues. This comprises of floods, heat waves in different regions, unseasonal rainfalls and many remaining problems are also the part of them (Khoso et al., 2025).

Consequences of Climate Change and Floods

A number of studies and research have apparently portrayed that the changes in climate are significantly due to the accelerating increase in temperatures, fluctuating rainfall patterns, and other harmful, disastrous gases. Major players are the greenhouse gases without any doubt, but certain contemporary phenomena have made it clear that the reasons and causes are still mysterious (Mirza, 2010). The escalation of the Earth's temperature was already anticipated. At present, it is believed that a substantial increase in rainfall is also instigated by the rising temperatures in the atmosphere. In some parts, heavy rain was witnessed in the typical and regular raindrops. Such regions experienced extreme scarcity of foodstuffs and floods. The remaining spatial sections of the country observed instabilities in the rainfall occurrences, containing unseasonal, sudden, and unexpected rain events. Those districts that are vulnerable to flash floods are critically distressed by the slightest deviations in the weather and environment. The over-spilling of water bodies, mainly due to the irregular floods of rainstorms cause unrecognizable and unnatural mutations to the areas and regions affected by the calamity of floods (Annual Flood Report, 2017).

The pattern of rainfall has altered a lot and, in some cases, it has been greater than before. The reason for this, as given by some researches is the discharge of a massive volume of polluting fumes in the surrounding atmosphere. The other cause of the disaster of extreme floods is the unnatural and wildest intensification of the planet's temperature of the planet. Now, the heavy and more intense rainstorms and downpours have been witnessed since this escalation of temperature (Ullah and Takaaki, 2016). In recent investigations and research have clearly recognised that the major reason for the unexpected and life-threatening floods is one and only the only climate change. Some floods are mainly due to the overflow of water bodies. The foremost reason for this is that many businesses and corporations, and even the general public is destroying the woodlands. Secondly, the disturbance in the planet's temperature is gradually resulting in the reckless ablation, and lastly, the dumping and discarding of trash has augmented not only by the locals but also by the tourists (Akhtar et al., 2025). The most susceptible part of the planet to floods has been the southern region of Asia. In this region, a large number of catastrophic and dreadful floods have been recounted in different periods of time. They have caused grave devastation not only to the material but also to the non-material assets of the region (Mirza, 2010). According to the explorations, it has been estimated that the parts of South Asia would be rigorously damaged to a greater extent in the coming times. Pakistan is confronting copious violent calamities. The reason behind all these scenarios is mainly the unexpected turning points of the weather. These severe events have increased in numbers just because of abrupt alterations in typical weather. Thousands of lives of

acquitted people have vanished in the flood of the year twenty-ten by the brutal weather changes (Mirza, 2010). The glaciers present in the neighbouring regions of Pakistan have tremendously started melting leading to the rise flood dangers in the country. In the state of Pakistan, there are a number of diverse regions and areas. Each has distinguished topographic and demographic features. In such areas, the communities surviving closely to the water bodies are on the verge of dangers of flooding. Whenever there are severe thunderstorms, the level of water rises to life-threatening levels, which is enhanced by the liquefaction of ice-mountains. The northern regions of the country, which have been previously well-known for cold weather, are now witnessing an unusual rise in temperatures. Many terrible and disastrous floods have happened there, which have seriously impaired those areas (Akhtar et al., 2025).

Impact of Floods due to Climate Change

Agricultural Sector

Floods cause irreversible damage to the fertile land areas because of strong streams of water. This makes the fields unsuitable for future growing and cultivating fruits and vegetables, and also destroys the existing harvests (O'Connor & Costa, 2004). This also causes damage to the availability of food materials, including grass for livestock. Floods bring a large amount of solids and water dumps along, causing severe damage to the quality of soil, making it unfavourable for sowing seeds (Posthuma-Doodeman, 2008). The agronomy and cultivation sector is always exposed to the calamities of floods. This ultimately induces scarcity of harvests and produce. This destruction fluctuates from land to land, season to season, and lastly, water holding capacity of the soil. In cold weather, intense rainstorms have not been observed; consequently, a minute influence is recorded on the plant production. On the other hand, the disastrous number of destructions have been recorded if the floods occurred in the summer season (Morris & Wheater, 2007).

Animals are usually dependent on plants as their food source. Its production and growth are acutely affected by the flood occurrences. The feeding lands of the animals would be dislocated, as estimated by a number of studies. The other substitutes for grass were used for the livestock. The public refused to purchase the damaged products due to floods (Chau et al., 2013). It was assumed that the harvests would be detrimental and comprised of risky materials. The budgets and expenses resultantly stirred than usual because a diverse range of exclusive chemical compounds were mandatory for the safety of the farm fields from the floods (Akhtar et al., 2025).

Cattle and Livestock Sector

The animals, such as goats, sheep, cows, and buffalo, have been an essential requirement for the survival and continuation of the lives of humans. Such imperative sources have been flushed in the strong, life-threatening streams of water. Because of flooding activity, the ways and routes to the grazing fields are destroyed and become the most central barrier to their existence. During the times of such disasters, a considerable number of infections and viruses began to take the whole affected area under their circumference (Ferdous et al., 2013). The stature of the trees and other plants is relentlessly affected in the domains spoiled by the dreadful flood proceedings. According to the management reports, the yard goods and other subsequent sectors were significantly overwhelmed during flood seasons compared to the irrigation branch. All the beneficial and valuable equipment of these industrial units was submerged under water, leading to the mechanical complications (Beckerman, 2001). Among the rest of the glitches, mushy, swam, and water-saturated fields and lands are also a significant source of unease. All of these issues play their improbable role in the demise of the creatures (Huber & Gulledge, 2011).

Forestation Sector

The flooded water is awfully hazardous and lethal for the soil, as it is not merely water but also comprises other detrimental elements like several gases, which utterly disrupt the nature and composition of the earth's

soil. This critically distresses the undergrowth of plant life existing in such spaces. Such muddy water also contains a hefty quantity of industrial chemical compounds and perilous discarded substances, which are not appropriate for trees and plants (Gillitzer, 2009). Occasionally, this is more than just simple water and comprises enormous slabs of ice and remnants of constructions that broke the shoots, trunks, and materials of the trees (Bratkovich, 1994). This interrupts the nutrient manufacturing practice of flora through daylight and leads to the decease of them. During the periods when baby climbers and sprouts are in the preliminary phases, they are more exposed to the side effects of floods. However, resilient and sturdy trees endure this interval more certainly (Johnson, 2009). This totally imbalances the movement of gases underneath the top soil and makes the indispensable nutrients unapproachable to the roots and origins of the trees. During the scorching weather of the year, even two to three weeks of extensive torrential adversities are destructive and ruinous for them. When the high floods followed in the highlands of the Northern Province of Pakistan, the earnestly obstructed ones were steers. Hundreds of thousands of cattle and livestock were affected (Looney, 2012).

Finance Sector

The time period after the overflows is decisive and stresses the transformations linked to the finance sector on an exigent basis. Instead of concentrating on attaining exterior assistance, there is a necessity to emphasize deciphering the problems by employing all internal and national available resources and capital. The fiscal circumstances of folks breathing in those flood-prone zones are appalling (Aftab, 2010). They have no other choice but to construct and erect their trivial residences in such spaces. One of the pastoral areas of Charsada was desperately affected and was restored in spite of the predictions of further flooding and downpour activities in that region. It was supported by different organizations working for the well-being of societies. As the residents were offered the lowest prices for the damaged areas, the efforts of those institutions were in vain. There is an extreme urge to resolve such matters at parliamentary and civil service departments to manage their system in forthcoming episodes. The supreme essential fact is to have adequate and plentiful reserves of aquatic bodies, as it is fundamental for the persistence of the anthropological lifespan. The quality of water surely matters in this respect. The pure and uncontaminated water is responsible for the steady and balanced atmosphere. The composition and standard of water go below par mainly due to heavy downpours. Not only do humanoid actions trigger the inconsumable water, but the natural calamities are correspondingly liable (Aftab, 2010).

Responsiveness of Government

None of the individuals or institutions is refuting the certainty of the dreadful realities of climate change. As it is the prime reason for the devastating consequences of precipitation, famine, melting of icebergs, and many other catastrophes. The additional cause is that government and administrative officials frame policies and guidelines to minimize flood-related devastations nonetheless, there is no effective and operative enforcement at the ground level (Bożerocka, n.d.). In the recent two to three years, the floods were absolutely unanticipated, and administrative bodies were not equipped. This generated massive complications for repositioning the general public. The absence of synchronization was also perceived amongst the executive divisions. Pakistan is already dealing with inadequate monetary possessions, and in this set-up, this further heightened the problems (Syed, 2024). The government was not proficient in the general commonalities, and the only way out was just the overseas assistance from the global world. There was no appropriate supervision of capital flows from other states. This makes it problematic to reach the genuinely deprived public. They show solemn apprehensions for the ineffectiveness of governmental bodies. Moreover, the number of political parties has increased to a large extent, and each operates for its own reimbursement (Majeed, 2023). Native welfare associations and communities came forward to give relief to their brothers in need. Various donation programs were initiated by the administration, providing fiscal support and assistance to the distressed households. A policy was created solely focusing on climate change at the national level. It concentrates on what steps would

be taken by the government to diminish the damage of climate change. It comprises struggles to conserve and safeguard water sources and a drop of emission of detrimental gases and ecological agricultural practices. All this was to subsidize the universal determinations regarding shifting weather conditions (Syed, 2024).

The loss of Human lives During Floods in Pakistan

Pakistan is facing a climate crisis that is being experienced all around the world. The drastic floods that started in June 2022 in Pakistan have been disastrous. One third of the country's landmass was flooded, with the destruction of 3.6 million acres of crops and over 750000 livestock. Approximately 24000 schools have been run-down, and a number of bridges and roads have been destroyed. The loss of food construction, crops, and framework is approximately US30 billion dollars. The floods affected over 33 million people, displaced 7.6 million, and claimed over 1,500 lives, including 552 children. The floods proved enormously fatal, which dreadfully impacted the lives of more than thirty million individuals. Above five hundred youngsters expired and numerous general masses were displaced. The majority of such families were, in fact, accommodating quite close to rivers, and their fiscal capability was below average. This catastrophic event severely affected the infrastructure of hospitals, generating a bulk of complications for emergency circumstances, especially for expectant mothers. More than five hundred healthcare units were disrupted in these floods. The National Flood Response and Coordination Center was established on August 30, 2022, in response to a significant flooding crisis in Pakistan. Initially, the global response was characterized as slow and disorganized. In an effort to expedite aid, the UN Secretary-General launched a flash appeal seeking $160 million for immediate flood relief. However, contributions from external sources have been sluggish, raising concerns about the adequacy of the funding compared to the immense scale of the disaster. Khan and his colleagues in 2021 underscored the flood risks in Pakistan, indicating a 10% probability of experiencing damaging floods every ten years. With the nation's GDP reported at $28.9 billion, the catastrophic flooding has impacted approximately 111.9 million people, leading to civilian losses estimated at $2.44 billion (Bhutta et al., 2022).

The 2010 floods were recognized as one of the most calamitous natural disasters in history, particularly devastating for Pakistan. Despite relatively lower death and injury rates compared to other natural disasters, its impact was profound due to the geographical and demographic factors involved. The flood predominantly affected agricultural lands and crop-producing areas, exacerbating the situation by diminishing food supplies. Consequently, this disaster negatively influenced both service and manufacturing sectors, leading to significant economic disruptions and the loss of livelihoods for thousands of individuals. The scale of the affected population and the extent of the devastation surpassed those of previous disasters, marking the 2010 flood as unprecedented in its severity and consequences. Accommodations, education institutions, power poles, health centers, electric generators, harvestable crops, cropland, cows, bulls, sheep, animals; a surge in water didn't spare anyone and caused major destruction. Plenty of people lost their lives, living places, income, and earning assets; no other natural disaster caused as many deaths as the flood caused in Pakistan (Niazi, 2013). During this hard situation, people were moved to safe places due to hunger and a shortage of food and shelter. In this tough situation, the army played a vital role in helping the people reach safe and sound places.

Climate Change Effects on Citizens well-being

An increase in temperature and humidity would extend the number of months that the mosquitoes will be active and subsequently worsen malaria. This may be expected to become a significant emerging threat in the North of Pakistan, where the season of the mosquito is already restricted by the low temperature during winter. Malaria is not the only disease of vectors that will continue to spread to the north. In addition, water and air temperatures are crucial for the reproduction rate of the disease. In the north side of Pakistan, gains in infectious diseases can also be expected. The latest incidence of the dengue virus in particular areas of Pakistan may be taking its toll on climate change. Shah (2012) reported that “In 1994, the initial incidence of the dandy

virus was declared in Pakistan; thus, the quantity has grown far beyond thousands of people". In contrast utmost weather conditions and maximum heat conditions caused acute lung disease, diarrhea, heart attack, etc. In recent years, it has been seen that maximum climate change conditions mostly occur in Punjab, Pakistan, throughout December and January, which caused the utmost fog (Ebi et al., 2008), huge ice fog, and global warming affected plants and individuals. The transmission of dengue heavily relies on weather conditions, and there is a lot of concern that climate change would expand the disease to regions that are yet to be affected (Maha et al., 2014). Social effects will also be affected by climate change, both positive and negative; people's displacement and loss of their revenue due to intense natural events like floods. In this regard, it might also endanger hundreds of jobs; this may be realized. Raise in price and inflate number on price, and raise of people. People face issues such as food shortage, job crisis, and shelter. These hazards will be responded to according to the blend of physical, financial, natural, human, and social factors. The rural people who lived in houses after the flood they make through mud. On the local level, in three areas of choice (Badin), Rajanpur, and Khuzdar, Punjab District, Sindh, Balochistan), communities' drastic climatic changes have been shown to damage communities. The significant climate health is connected with socially induced effects, radiant weather conditions, foresight, conflicts, and security. (Oxfam, 2009).

Adverse Influence on Hydrological Resources

Commission Planning (2007) reported that "Fresh water resources are today facing a shortage in Pakistan. Water availability per capita has reduced to 1,200 cubic meters in 2003 as compared to 5,600 cubic yards in 1951, and now close to the drought of 1,000 cubic yards per person". According to the research of Maplecroft Water Security Risk ratio (2010), Pakistan is among the most vulnerable countries, and it is ranked in seventh position among the 165 countries (Maplecroft, 2010b). The country is largely dependent on two sources of hydrology, which include precipitation and ice floe iceberg water. The water sources of the country are quite limited, mainly affected by the disruptions of the weather. There is a need to improve the water usage by introducing technologies for irrigation purposes. An enormous quantity of water from the rivers of Pakistan is actually wasted in the guise of irrigation (Ahmad et al., 2007). Commission Planning (2007) stated that the sources of freshwater are declining day by day in the country. The numbers of population are rising every day which is directly impacting the availability of water sources. That time is not far when there would be scarcity of water i.e. 1000 cubic yards. Major water sources of Pakistan are either from rain or glaciers. These are seriously disrupted by climate change. Maplecroft (2010b) reported that according to the index of water security risk, Pakistan is the most vulnerable state positioning at the 7th number amongst the rest of the countries. Global warming has far-reaching implications on every aspect of human life. Natural ecosystems and human societies suffer the effects of anthropogenic warming. Lack of action to reduce rising temperatures would put the planet in a risk of living conditions (Khoso, 2025), Global climate change has immense impacts on the water supply for the whole world as the sea waters have been raised, the mountain areas are effected more often and the Oceans have been tightened their boundaries day by day just because of the climate change as the warming condition of the world and unfortunately it has been the main focus now that what is advised now to push back these problems.

Challenges Due to Climate Change

Pakistan is the most susceptible to climate change. Some of these weaknesses are described below:

Food security

Heat pressures and other adverse climatic changes are reducing crop yields and livestock production, thus posing a risk to food security and livelihood. Climate change threatens global food security by reducing crop yields, disrupting supply chains, and increasing food prices, potentially pushing 132 million more people into poverty by 2030. Rising temperatures and extreme weather, such as floods and droughts, severely impact

agricultural productivity and, consequently, the availability, access, utilization, and stability of food.

Irrigation

Warmer temperatures increase evapotranspiration rates; therefore, more water is required through irrigation; nevertheless, water resources are declining because of changes in precipitation regimes and decreases in river flow due to ice melting. Climate change increases global irrigation demand by roughly 6.4% to over 12% by 2050 due to higher temperatures, elevated evaporation rates, and erratic rainfall, often acting as a necessary adaptation for crop survival. While irrigation stabilizes food production during droughts, it accelerates water scarcity, triggers groundwater depletion, and can cause soil salinization.

Water Scarcity

Climate change is driving a global water crisis by accelerating the water cycle, intensifying droughts, and melting glaciers. Rising temperatures increase evaporation, reducing surface water and soil moisture, while unpredictable rainfall damages sanitation systems. By 2050, up to 3.1 billion people could face increased water scarcity, threatening food security and aggravating conflicts.

Extreme Weather Events

Extreme climate changes could effectively become a very severe problem for biodiversity, such as floods and sudden earthquakes, which are commonly caused by climate change. Climate change is driving a rapid increase in the frequency and intensity of extreme weather events, including deadly heatwaves, intense storms, severe droughts, and wildfires, causing significant risks to human health, ecosystems, and economies. Rising global temperatures enhance the water cycle and accelerate evaporation, leading to more, heavier precipitation.

Lack of Technical Capacity

In addition, it lacks the technical ability to predict and react to the variation of climatic conditions. Sustainable Development Goal number 13 (Combating Climate) highlights the urgency of climate-related disasters and adaptation since it is evident that the rate and intensity of such events are growing. Floods also disrupt water supply and quality and thus require strong water-management interventions, which also influence Sustainable Development Goal number 6 (Water, Sanitation, and Hygiene). The events of civic flooding indicate the significance of Sustainable Development Goal number 11 (Climate-Friendly cities and Societies) that entails resilience in the framework. Furthermore, Farmers face flood impacts in cultivation, soils, as well as the ecosphere, hence conform to Sustainable Development Goal number 15 (Land-Based Life) that enhances eco-friendly land and environmental protection. The interconnections linking global warming and the effects of floods in Pakistan offer a context for evaluating the current trends, issues, and opportunities in managing food-risk and sustainable development goals, in general (Khoso, 2025).

Recommendations

To decrease the chances of floods and climate disaster few steps must be implemented at any level of the state for better results. A few are listed below:

- To make sure of better results government should strengthen the climate change governance and policies. Focuses on the management of lower levels, especially rural areas in which civil government should be active to plays vital role for better management.
- The government should strengthen its nationwide policies on climate change through laws by giving proper roles to all governmental and climate sectors of the state.

- The insurance industries should also play their role by reducing the loss of crops and livestock, which results droughts, cyclones, and flood-type disasters.
- Infrastructure management is also responsible to counterbalance environmental board and human needs by integrating flood and water management systems.
- The Ministry should also prevent seawater incursion to minimize the flow of the Indus River delta region, which could damage the aquatic life around that area.
- Technology is also a main source to reduce climate change losses by using water-conservative technologies to decrease flood risks, such as rainwater harvesting.
- Lowland and inadequate sewerage have led to pandemic drenched, creating a need for technically applicable drainage systems to reclaim the delta's heavy soils (Shah, Zhou, & Shah, 2019).

Conclusion

This research aims to identify the important elements, causes, and consequences of climate change in Pakistan, including water security, flooding, earthquakes, and droughts. In order to give a complete view of the hazards related to global warming, the history of environmental change and its current developments, devastation brought on by floodwater connection, the concerns that arise from urbanization, and other social and economic affairs will be discussed. Effects of climate change are world-wide but South Asian countries are severely affected due to high inflation rate, poverty, and a large population. This study mainly focuses on Pakistan because of low adaptability and limited financial and physical resources. Pakistan is greatly affected by climate change. On the basis of a variety of flood indicators, a topology is made. Topologies focus on the root causes of floods and provide in-depth insights into these climate changes. They emphasize the need to take various steps to prevent flooding in urban areas.

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