P-ISSN: 2709-6254	Journal of Development and Social Sciences	Apr-June 2024, Vol. 5, No.2(S)
O-ISSN:2709-6262	https://doi.org/10.47205/jdss.2024(5-II-S)26	[257-266]

Journal of Development and Social Sciences
www.jdss.org.pk

RESEARCH PAPER

Pakistan's Climate Conundrum: Revealing the Nexus Between Climate Change and Internal Migration

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ABSTRACT

Migration due to climate change has become a common phenomenon worldwide, and Pakistan is not an exception. Climate-impacted migrants not only face socio-economic implications as security risks but migrant communities also suffer from exploitation. In Pakistan, Climate-induced migration poses challenges for every province. The study examines the relationship between international migration and climate change in Pakistan and evaluates the impact of climate change on different regions. Qualitative research with secondary data sources has been used. Using a thematic analysis, a researcher has examined the dataset from several aspects and highlighted different patterns and how they relate to one another. The study finds that internal migration is an adaptive strategy for flexibility to climate change and offers economic opportunities and challenges in migrated urban centers. The Research finds that migration can serve positively and effectively if adaptation strategies allow the vulnerable population to diversify their income resources along with the environmental changes. Therefore, study suggests that government should mitigate migration issues, reduce conflicts, and promote sustainable development.

KEYWORDS Climate Change, Floods, Food Security, Climate-Induced Migration, Health, Migration, Pakistan, Risks

Introduction

The causal effect between environmental elements and human migration has long been recognized in academic discourse. This phenomenon of increased internal and international migration and displacement, primarily attributed to the impacts of climate change, has gained attention due to the severity of global climate change. While debates about climate change frequently focus on alarmingly high estimates of mass migration, evidence suggests a more critical situation. Rising sea levels in coastal areas put living in danger and reduce entire communities to uninhabitable, driving the local population to relocate inland or overseas. On the other hand, regions experiencing prolonged dry spells have to struggle with depleting water supplies and reduced crop production, which forces people to relocate in search of a better life. Several issues can arise due to migration from climate-affected areas, therefore migration is the causal effect of climate change. Migration of population and environmental degradation intensify the vulnerabilities, maximize socioeconomic gaps, and add these issues to existing issues of depleting resources (Vinke & Hoīmann, 2020).

People are left with no choice but to relocate themselves when catastrophic climate change occurs including sea level rise, floods prolonged droughts that start to intensify the impact. Migration is inevitable to secure a safe and sustainable life due to environmental challenges. These migrations often called "climate migration" or "environmental migration" can be shocking for the areas where they move, as infrastructure can be damaged and depleting natural resources can be drained infrastructure (Tabassum, 2014). These migrants would become a competition for these scarce resources of water, food and land. This competition would lead to conflicts among communities that are already experiencing the impacts of climate change.

Climate-impacted migrants are vulnerable to intensifying the existing issues in urban areas, multiplying the burden of already-stressed urban infrastructure and increasing public unrest. Since informal settlements lack basic infrastructure and services, they are frequently forced to relocate as climate migrants, worsening the problems of poverty and inequality. This also has an impact on lifestyle, cultural and social structure of already residing communities and the new settling communities brought on by climate change. Migrating societies, usually possess strong affiliation to their land and face significant hurdles while adjusting to new environments, thus jeopardising traditional and cultural heritage. (Siyal, Khalid & Qaisrani, 2018). The people's capacity to migrate and settle is influenced by issues like access to resources.

Internal Migrations are difficult to evaluate without errors due to the definitions and issue of reliable data availability on internal mobility. It is not shocking that there is relatively insufficient research on migration due to climate change in Pakistan. Chen and Mueller (2019) conducted a study, focusing on the problem of rural-to-urban migration and semi-arid regions of Pakistan. They examined important meteorological factors at the village level, such as total rainfall during the monsoon (June-September), average winter temperature (November-April), a 12-month moisture index, and the number of fatalities caused by flooding. The study shows a strong correlation between migration and extremely high winter temperatures. Moreover, over one-third of agricultural yields are lost due to high wintertime temperatures. As a result, the estimates' magnitude and statistical significance are greatest for those who lack assets and land, and the majority of them move outside of villages. Some argue that because they are not burdened by assets or land, which can be difficult to sell and are vulnerable to loss if neglected, they may have the freedom to choose where they live.

The study focuses on permanent internal migration (rural-to-urban) that is caused by long-term climate change rather than by sudden climate disasters because the above-mentioned study is focused on permanent migration. The relationship between migration, heat stress, and climate change is discussed in the sections that follow regarding wheat production and poverty within the national context. Subsequently, the semiarid regions of Pakistan that are hotspots for possible migration are identified.

Literature Review

Pakistan is a low-middle-income nation with low human development, and there are differences in poverty, income, and infrastructure between rural and urban areas. The majority of the population lives in semi-arid, and the largest industry, employing 44% of the labour class is agriculture of whom 68% is in rural areas of Pakistan (GoP, 2017b). Rainfed regions are dominated by sustenance farming, while semi-arid regions with more sustainable water access tend to have irrigation-based farming. Mainly Pastoralism is in arid regions where poor communities move periodically in search of water and food. Although it is commonly observed that rural poverty is more severe in arid and semi-arid regions. It is frequently linked to exposure to climate challenges, homelessness, and unstable access to basic necessities (Saleem, 2013). While 86% of farms with farm sizes of less than 12 acres are owned by small farmers, 50% of the rural population is landless overall (GoP, 2017a). In contrast, despite housing one-third of the country's population, Pakistan's urban economy accounts for 78% of the country's GDP (Xu, Abbasi, Hussain, Albaker, Almulhim, & Alvarado, 2023). Many Pakistani cities are populated at an annual rate of 3% urbanization with between 35% and 50% of the urban population reportedly residing in informal settlements. The government of Pakistan estimates, over half of Pakistan's population is expected to live in urban areas by 2030 (GoP, 2014). These projections don't account for how climate change is affecting urbanization, population growth and rural-urban migration.

Some of the research studies have attempted to investigate the connection between factors as they are interdependent. These studies suggest that differences in climatic

variables, such as average temperature and precipitation, have an impact on agricultural productivity in rural areas. Winter crop productivity has been demonstrated to be impacted by heat stress in particular (Nadeem, et al., 2018).). For instance, climate change may cause a 5-to 25% decrease in the production of wheat, a main food that is consumed by the majority of Pakistanis (Gul, et al., 2022).). Majid and Zahir (2014) found similar results in their investigation of the effects of climate change on socio-economic vulnerabilities and agricultural productivity in Punjab and Sindh. They claim that the main climatic factor that has a major influence on wheat, rice, cotton, and sugar cane yields is drought. Occupant farmers suffer from declining crop yields, which forces them to look for other sources of income and occasionally even relocate to urban areas. This is comparable to the ground-breaking research by Koubi et al., (2016), in which heat stress plays a role in internal migration within Pakistan.

Independent studies that look into Pakistan's internal migration flows exist. It was estimated in a study that 42% of Pakistani migrants relocated within districts, 39% moved across district boundaries, and 19% moved across provincial boundaries (Ali, Khan, Alamgir & Khan, 2018). Siyal et al., (2018), highlighted that Sindh and Balochistan had the lowest rates of migration from rural to urban areas, with Punjab comparatively higher rate than Sindh and Balochistan, and Khyber Pakhtunkhwa (KPK) has the highest rate of migration. Most migrants from rural areas migrate to overpopulated areas. For instance, according to About 63% of migrants in the past ten years have relocated to an urban area, with 56% of them relocating to the provincial or federal capital. Zafar et al., (2013) discovered that 80%of migrants from Faisalabad migrated due to insufficient economic opportunities and 14% migrated due to educational opportunities. Floods have become another cause of migration in Pakistan recently as Pakistan experienced severe floods in 2010 and 2022 (Otto et al., 2023). Pakistan is eighth among the nations most severely affected by floods and is highly exposed to them. The country has already suffered greatly from the negative effects of climate change and will continue to do so in the future. (Hussain, Butt, Uzma, Ahmed, Irshad, Rehman, & Yousaf, 2020). Floods in Pakistan between 2010 and 2014 caused losses over USD 18 billion. According to the World Bank in 2015, these floods destroyed 10.63 million acres of crops, damaged 3.45 million houses, and affected 38.12 million people. As per the Global Climate Risk Index 2018, Pakistan suffered 566 fatalities and USD 47.313 million in losses as a result of severe weather in 2016 (Aslam & Farooq, 2023).

Material and Methods

The study uses qualitative research methods in addition to an exploratory approach using secondary data sources with thematic analysis of the published research on flood, agriculture security, climate change and migration in Pakistan". To include all studies with various flood terminologies, the terminologies with the floods and internal migration were added to increase and broaden the investigation of research. To gather data criteria were fixed to include those articles and reports that have these terms in title, abstract, and keywords from 2010-2024 mainly focusing on the causal effects of the 2010 and 2022 floods as well as agriculture, heat waves, poverty and crop yields in Pakistan. By using a thematic analysis, a researcher has examine the dataset from several aspects and highlight different patterns as well as how they relate to one another. To give readers a thorough understanding of it without having to read every referenced paper, it is helpful for researchers to connect and integrate various concepts, or difficult problems under one overarching theme.

Results and Discussion

Pakistan Climate Risk Profile

Pakistan has climate variations climate along with the country's topography. In coastal regions, it is hot and humid along the Indus River's lowland plains, and it gets colder

while going upward towards the northern highlands and the Himalayas. Pakistan is vulnerable to the impacts of climate change due to its highly diversified terrain and dense population. In the summer, the Eastern parts of the country receive precipitation due to monsoon rains; in the winter, the northwestern areas and half the Southern half receive precipitation due to Western weather turbulences (Ma et al., 2023). Except for the northern regions, where monsoons (July-September) can bring rain as much as 200 millimeters per month, most regions of the country receive very little rainfall. According to the Global Climate Risk Index, in 2020 Pakistan is at number five among nations most vulnerable to climate change. Some of the impact Pakistan is currently experiencing include monsoon rains, high temperatures, an increase in the severity and frequency of weather-related disasters and events and the melting of northern glaciers (Saira et al., 2023).

Pakistan is a water-scarce country and is ranked third among the nations that are experiencing a scarcity of water. It is estimated that by 2028, there will be "absolute water scarcity" in Pakistan. According to the analysis of historical environmental trends, droughts have severely impacted the Indus Basin ever since the 19th century and are expected to become more severe and frequent due to climate change. Coastal communities in Sindh are most affected by sea intrusion. Mangrove forests' disappearance, land degradation, and contaminated water supplies are common. Consequently, local communities are left with no choice but to migrate due to food insecurity and poverty (Janjua et al., 2021). Similar impacts of climate change can be seen in areas of Balochistan, particularly in the Badin district, where extreme sea intrusion has been observed up to 85 km up freshwater canals, severely causing the shortage of the availability of water for human consumption along with a shortage of agriculture yield forcing the people to migrate.

Climate Change and Migration Trends in Pakistan

The intense heat waves and floods resulting from monsoon patterns have grown considerably due to shifts in climate crisis across various regions in recent decades. These abnormalities have had deep impacts on the economic condition, natural ecosystems, human health, and agriculture in Pakistan (Khayyam, 2020). In Sindh Badin district, characterized by its swampy and fertile terrain, is suitable for rice cultivation. However, it is vulnerable to cyclones and floods due to its closeness to the sea. The region experiences extremes in temperature, with the as high as 49°C and the lowest to -1°C. Karachi is the seventh-largest urban city in the world and the first-largest city in Pakistan. Arabian Sea is on the south and the southeast side has mangroves and streams of the Indus delta, adding to the city's ecological diversity and significance. It has mild winters and hot and humid summers. Rohri experiences dry conditions, with minimal rainfall during the monsoon season. The Indus Delta harbors a significant mangrove area. The loss of mangroves because of climate change would have many impacts. It will reduce biodiversity, diminish the quality of coastal water, eradicate crucial nursery habitats for fish, and deprive local communities of dynamic resources and services provided by mangroves. Additionally, the destruction of mangroves can release substantial amounts of stored carbon, worsening global warming and other climate change phenomena.

In recent years, irregular monsoon patterns have led to highly destructive floods across South Asia, including Pakistan (Kazi, 2014). Pakistan experienced extreme monsoon seasons and devastating floods in 2010 and 2022. Extraordinary rainfall in mid-July 2010, persisting until September of that year, led to unprecedented flooding across Pakistan, affecting the entire span of the country. These floods have been characterized as the most severe since 1929. The monsoon flooding proved disastrous, impacting more than 20 million population and causing destruction to their homes, crops and infrastructure. An estimated $10 billion in damages resulted from this extreme weather event, with agriculture accounting for half of those losses. (Hashmi et al., 2012).

Over 20 million people were affected by the heavy rain and subsequent floods, according to the National Disaster Management Authority (NDMA). The heavy rainfall caused floods and landslides, which severely damaged the infrastructure in the impacted areas. Numerous homes have been destroyed, thousands of acres of agricultural land and crops destroyed, thousands of acres of urban areas flooded, entire villages washed away, and in some places, there has been severe soil erosion. The flood caused recovery and reconstruction costs ranging from US$8.74 billion to 10.85 billion.

The floods of 2010 in Pakistan had a direct impact on almost 20 million population, resulting in life losses of over 1,700 people. The flood also destroyed and demolished nearly 1.1 million houses and 436 healthcare facilities, intensifying the humanitarian crisis Lasting for nearly half a year in certain regions, the flood inflicted an extensive toll, amounting to $9.7 billion in damages across forty-six districts of Pakistan (Hashmi et al., 2012).

The consequences resounded intensely in rural areas causing unparalleled losses in infrastructure, crops, agricultural machinery, fertilizers, personal seed stocks, livestock, animal shelters, and fisheries. The extensive infrastructure losses, affected 2.9 million households, of which 1.9 million experienced severe damage or destruction. Additionally, approximately 80% of the country's food reserves were destroyed as a consequence of the flooding (Polastro et al., 2011). The floods also forced a significant migration of households, with 86.8% leaving their homes for two weeks to six months. Particularly, during the six months after the flood, 46.9% of households migrated, the majority (64.5%) remained in one place throughout this period, 34.5% relocated at least once, with 21.1% migrated twice, 9.9% relocating thrice, and 4.5% migrated to four or more locations, emphasizing the deep turmoil suffered by affected communities (Pakistan Floods, 2010).

Pakistan faced another disastrous impact of climate change in July 2015 with heavy monsoon rain along with melting glaciers and an outburst of glacial lakes in northern areas of Pakistan resulting in floods of the Indus River. Chitral district of Khyber Pakhtunkhwa was severely impacted by this flood with an estimated 285,000 people affected. It damaged the houses, lands, agriculture, irrigation system displacement of families and structural damages. Areas of Gilgit Baltistan, Punjab and a few parts of Sindh were also severely impacted by this flood. According to the NDMA report, 1,572,191 people and approximately 4,111 villages were affected. From 2010 to 2015, “Pakistan floods caused USD 18 billion financial losses, affected 38.12 million people, damaged 3.45 million houses, and destroyed 10.63 million acres of crops, according to the World Bank in 2015” (Waseem & Rana, 2023).

Pakistan faced heavy rain and floods in the middle of 2022 due to climate change along with glacial melt. one-third of Pakistan's territory was impacted due to heavy floods and landslides, severely affecting people's lives, property, infrastructure, crops, and agricultural land. The population affected by this climate disaster was almost 33 million. Of them, 20.6 million required life-saving assistance—half of them were children. A total of 7.9 million people moved away from their homes, with 664,000 of them taking up residence in unofficial settlements and relief camps. Pakistan designated 84 districts as "Calamity-hit," the majority of which were located in the country's south and center. Sindh was the most impacted province facing 70% of the total loss of Pakistan. The floods significantly affected Khyber Pakhtunkhwa, Balochistan, and Punjab but comparatively less than Sindh. National Disaster Management Authority (NDMA) reported that the 2022 floods caused significant damage, destroying over 2.3 million homes (Lohano, 2018). Moreover, the disaster ruined over 1.7 million hectares of crops, while 800,000 livestock animals perished. Resulting in more than 8 million individuals into poverty, causing the far-reaching socioeconomic consequences of the disaster. 30,000 schools were damaged or destroyed along with 2000 health centres that required repairing or reconstruction (Maqbool, et al.,2023). There was a shortage of access to basic needs like health facilities, food and clean drinking water for these migrants.

Climate Migration Conundrum in Pakistan

People have been migrating internally and internationally due to climate change all across the world for centuries. Most of these migrants have rural agricultural backgrounds and migrate to find work and return to their areas when the weather is suitable for agricultural production. However, climate change has disturbed this system for the last decade, forcing seasonal migrants to migrate permanently. Climate change causes migration in many ways as disasters caused by climate change force people to migrate in search of shelter; it can also cause sea level rise, which forces people to migrate inland; and it can result in deforestation, and droughts that kill livestock and destroy crops, forcing farmers and their families to migrate in for employment and better life.

Pakistan being an agricultural country has the same situation comprising arid land and most of the people rely on agriculture directly or indirectly for their survival. Half of the labour is dependent on the agricultural sector and Pakistan's foreign exchange is dependent on this sector too but climate change is making the situation worse for the country. Shrinking agricultural land, extreme weather patterns, extensive dry spells, and sea erosion have been the cause of migration in Pakistan. Seasonal migration is now turning into permanent migration as displaced communities prefer to stay instead of coming back. Climate change has forced people to migrate and frequent extreme weather events left people with no choice but to migrate permanently (Vinke & Hoīmann, 2020). This pattern of migration is becoming an issue of serious concern like food supplies, risk of livelihood, separating families and forcing whole families away from their homes. These impacts increase the risk of food security, hunger, poverty, and conflicts among vulnerable communities.

This climate-induced migration is not restricted to a particular region of Pakistan, it can be seen throughout the country. Khyber Pakhtunkhwa is facing multi-faceted climate challenges like heavy flash floods, land sliding riverine floods and droughts. Coastal communities of Sindh are facing the effects of sea level rise and sea intrusion (Schilling et al., 2013). The reports predict that with the current status of the rise of sea level Karachi will be sinking underwater by 2060 and Thatta and Badin by 2050. Drought is also a major concern for Pakistan. Southern Khyber Pakhtunkhwa, South-West Balochistan, South Punjab and South-East Sindh faced moderate to extreme drought conditions since last decade. Frequent drought has affected Sindh and Balochistan the most and the situation is becoming so worse that Pakistan has witnessed the worst natural disaster (Salik et al., 2023). The highland areas of these provinces witness a minimum of no summer rainfall causing a shortage of water resources drying up springs and tube wells. This has also dropped underground water tables in low-lying areas of the valleys. Shortage of water availability has interrupted the social structure of communities leading to economic disparities, food insecurities and health issues forcing people into conflict for depleting resources and then ultimately compelling them to migrate from that region (Ali et al., 2018).

In Sindh and Balochistan, long dry weather compelled rural communities to migrate near barrage areas in search of employment, water and food for their families. Pakistan's Meteorological Department (PMD) report says, 33 percent of the people from the districts of Noshki, Chagi, Kharan and Washuk have migrated away from their land. The drought caused 257 child deaths in Thar districts of Sindh in 2019 only. In Jacobabad, Sindh the temperature rises up to 52 degrees Celsius which is intolerable to humans. Khyber Pakhtunkhwa Chitral district has been severely affected by the impacts of climate change. Water scarcity and infertile land in this area forced the local communities to migrate to other places. Heavy rains and flash floods in Gilgit Baltistan forced the local population to migrate.

Over 40,000 people have left Pakistan's coastal regions of Thatta and Badin of Sindh province and migrated to Karachi as a result of extreme weather events such as the cyclones that struck in 1999 and 2005, seawater intrusion that has reduced up to 1.2 million acres of

infertile land, and water scarcity that has existed since the 1970s. 2010 floods and cyclones, forced people of Thatta, Badin, and Sajawal to migrate permanently to Karachi. During the 2010 floods, 200,000 people were displaced and they took refuge in relief camps, while 14 million people were temporarily relocated. It is predicted that Pakistan's hot weather with heat waves will have a far greater impact than its cold weather.

Conclusion

Every region of Pakistan is facing different impacts of climate change. Pakistan's high dependency on agriculture and fishing and unplanned urbanization have forced people to migrate to cities. There must be direct and practical relief efforts for rural communities with immediate action for access to clean water and sanitation services. Policy focus on climate-induced migration received the least attention from the governments and there is no policy to address the issue of internal migration. In 2009 the government proposed a National Emigration Policy but the major emphasis was on international migration. Internal migration has its apprehensions therefore it is not recognized as a potential adaptive policy to climate change. Warm Climate is becoming a new normal for Pakistan as it is unavoidable. However, the cost and consequences of this climate change will be determined by the response of the county and its population. Pakistan lacks resources, good governance, and resilience to disaster and now is the right time to learn from past mistakes to make policies for a better and prosperous future for every citizen of Pakistan. Pakistan needs to take decisive action to address the causes of climate change and focus on building resilience in vulnerable populations. The role of policymakers is to assist in mitigating climate-induced migration impacts for a sustainable future for the whole country.

Migration can serve positively and effectively if adaptation strategies allow the vulnerable population to diversify their income resources along with the environmental changes. For Instance, farmers may change from rain-fed agriculture options like livestock, fishing and other employment other than agriculture in cities to achieve a better life for themselves and their families. If diversified economic activities can be initiated then people can reduce their dependence on climate-affected areas and increase their resilience to climate shocks. Therefore, Pakistan needs a comprehensive policy framework for climate-induced internal migration, especially for relief and a better life for the rural population of Pakistan. That is how we can counter the stress that climate-induced migration is bringing conflicts to shake the country's stability.

Recommendations

- The government of Pakistan always overlooked internal migration issues. Despite the National Emigration Policy, the emphasis of the government has been on international migration, neglecting the significant challenges posed by internal migration. Government should mitigate migration issues, reduce conflicts, and promote sustainable development.
- The government should also address the issues of high dependency on agriculture and unplanned urbanization that driving force for the issues related to Climate-induced migration.
- Migration can be a positive force if the government and society adopt adaptation Policies. The government should transition from rain-fed agriculture to livestock, fishing, or urban employment. The government can also enhance living resilience for rural communities by Promoting diversified economic activities.
- Society should also reduce dependence on climate-affected areas and should enhance resilience to climate shocks. By promoting diversified economic activities, individuals can reduce their dependence on climate-affected areas and enhance their resilience to climate shocks.

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