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GROWING IMPACTS OF CLIMATE CHANGE ON PAKISTAN

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ABSTRACT

Climate change is not only a threat to the environment but it poses threats to the economic security of Pakistan as it is dependent on agriculture. If nothing was done, climate-induced disasters in Pakistan would worsen. In addition, Pakistan has passed through a phase of temperature enhancement in the last few decades. There is an average annual temperature rise of approximately 0.5°C compared to the 1960s average annual temperature. According to a global probability, global warming might reach an additional 1.3°C to 1.5°C by the year 2050 (Teske et al., 2022). In the past few years, disasters triggered by climate have magnified in Pakistan. Faster Global partners, the World Bank revealed that over $ 40 billion has been lost along Reconstruction in Pakistan with more than 1700 people dead and 12000 people injured in flood-affected areas in 2022. The magnitude of the population affected by flooding is expected to rise including the construction of new settlements in risky areas such as the rate of around 5 million people potentially at risk of extreme river floods in 2035- 2044, an additional approximately 1 million probable annual risk of coast flood in 2070-2100. According to the World Bank, the climate shocks, extreme events, and pollution of the environment and the air lowered Pakistan's economic capacity and brought forecasts that the country's GDP will be cut down by 18-20 per cent by 2050. This will reverse any gain on economic development and poverty eradication.

INTRODUCTION

Climate change is not only a threat to the environment but it poses threats to the economic security of Pakistan as it is dependent on agriculture. If nothing was done, climate-induced disasters in Pakistan would worsen. In addition, Pakistan has passed through a phase of temperature enhancement in the last few decades. There is an average annual temperature rise of approximately 0.5°C compared to the 1960s average annual temperature. According to a global probability, global warming might reach an additional 1.3°C to 1.5°C by the year 2050 (Teske et al., 2022).

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The rainfall is becoming irregular and Sporadic While mean annual precipitation is likely to diminish in several locations, increasing heaviness and variability of precipitation in others is also possible. This variability is already an implication for the occurrence of extreme weather such as floods and droughts (Brunner et al., 2021).

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down by 18-20 per cent by 2050. This will reverse any gain on economic development and poverty eradication.

Rising Temperatures and Heatwaves

Pakistan is located in South Asia at an elevation of 235 meters above sea level between 24 o N and 37 o N latitude and 60 o E to 75 o E longitude. It is a country that occupies such a vast tract of land that the climatic conditions of one part are almost outrightly different from the other. The climate varies from being predominantly arid with hot summer and cool or cold winter and large fluctuations in temperature between respective locations (He et al., 2023). It is a fact that the high temperature and high humidity for a certain duration are potent weather risks. High values of heat index can even be dangerous to people involved in outdoor exercises for a short while or even a day; the overall threat to general public health is heightened in the case where the given heat index persists for a longer period. The heat index is a term used to refer to the amount of stress that is put on human beings due to high temperatures in the atmosphere and moisture. With increased moisture content in the atmospheric air, it becomes difficult for the human body to lose heat by radiation and therefore causes stress in the body (Furukawa et al., 2020).

Health and Socioeconomic Impacts of Rising Heat Index

As many cities in Pakistan have experienced, heat waves have intensified in the recent past, supplemented by the UHI effect, especially in populous cities. All the same, most of the urban Pakistanis are ill-equipped to respond to the rising number, severity, and variability of heatwaves across cities in the country (Klingelhöfer et al., 2023). Sprawling and in some cases chaotic growth have led to poorly developed transport systems, little or no green areas, and generally poor living conditions which however make people vulnerable to the effects of heat waves. Thus, densely populated cities like Karachi, Lahore and Islamabad are most at risk due to their faulty planning. Hazards; heat wave is a standard feature in Pakistan especially during summers in an urban part of the country causing thousands of deaths mostly affecting the society's sensitive groups including the children, the elderly, workers under direct sun and individuals with pre-existing medical conditions. Just the recent heat wave in Karachi in 2015, about 1200 people died because of the heat (Kamal, 2022).

Impact on Agriculture and Food Security

Currently, Pakistan is a low–income developing country. It is the most dominant industry of the country in satisfying the food and fibre needs of the rapidly increasing population. It should be noted that even if the growth rate has reduced from over 3 per cent in the 1980s to 2.09 per cent in 2009-10 the growth rate is considered high.ng population. Although the rate of population increase has considerably slowed down from over 3 per cent in the 1980s to 2.09 per cent in 2009-10, it is still considered high. The current population growth rate is indicative, that the population will double by 2050 –Pakistan in be one of the four largest population nations in the world by 2050 the currently ranked as world's 6th most populous state [Pakistan (2010)] (Omolola et al., 2023).

The total cultivated area which is the basis of food production has only risen by 40 % over the 60 years, there has been over 4.5 times increase in population with an urban sprawl of over seven and a half fold and population pressure on the cultivated land leading to the formation of megacities. Wheat being one of the major food crops has surged fivefold during the same period despite that Pakistan is still a marginal importer of wheat. Substantial amounts of effort are required on both fronts to bring down the food surplus and deficiency or the food supply-demand-latency porter of wheat. Tremendous efforts are needed both advances in technology and population control to narrow the food supply-demand gap. Eradicating poverty, hunger and food insecurity are among the MDGs and some of the things that must be achieved before any country can develop economically (De Jong &Vijge, 2021).

It was established that there is a food security-economic development complementarity where food security promotes economic development at the same time, as the latter fosters food security. A country which is unable to produce the needed food and lacks the resources or the capacity to purchase food in the international market to meet the demand-supply gap is not food sovereign state (Borras & Mohamed, 2020). Food security is therefore a key

component of national security, which as a rule is not considered. Especially a sharp increase in global food prices in the later part of the first decade of the twenty-first century brought the issue of Food Security into limelight, especially in the developing world (Amusan, 2021).

Socioeconomic Vulnerability and Food Insecurity

Fluctuating temperatures, unpredictable and irregular precipitation regimes, high humidity concentrations and the more frequent instances of extreme weather are critical threats to natural ecosystems and negatively affect the regions of agriculture, water, coastal zones, livelihoods, health and food security in Pakistan. According to Maplecroft, Pakistan is ranked at 16th on the index of countries most exposed to climate impacts and the country is experiencing increased pressure in exploiting natural resources and the environment; climate change is set to further compound these." Even today there is the shortage of water supply in many parts of the country; there will be a drastic reduction of this, and with it food creation (Belhassan, 2021).

They predict that global temperatures are to rise higher in Pakistan than the average rise in the world hence lowering national crop yields. A consistent and somewhat steeper rise in temperature is expected in the northern areas as opposed to the southern areas of the country. Production of wheat, rice, some other cereals and some important cash crops would reduce in all the regions of the country except Northern Mountainous areas where wheat yield is expected to rise because of relatively higher temperatures during winter (Li & Lei, 2022).

Climate-Related Challenges to Crop and Livestock Yields

Due to somewhat improved level of awareness among the policymakers and other relevant actors in the country, the question is receiving more attention within the government's development course. Several biophysical, social, and institutional factors have been stated to terms of influencing the development of climate change policies in developing nations: International organizations, agencies, and institutions have offered technical and financial support for awareness-raising of climate change issue, its sensitization in policymaking and building institution capacities in developing countries (Upadhyaya et al., 2021).

Research on the issues offers important policy insights and directions as well as general policy ideas and systematic implementation strategies. Regrettably, there is insufficient empirical literature available to understand the contours of climate change-related issues in Pakistan, and the existing literature is quite limited in its focus. The work already done in Pakistan concerning studying the consequences of climate change on agricultural productivity at the country and or regional level is essential to understanding the severity of the issues at hand and developing adequate control measures at the country and/or regional level (Adhikari et al., 2020).

Water Scarcity and the Melting Glaciers in the North

The Indus River basin lies in Afghanistan, Pakistan, India and China and is over 30% arid, thus even drier than the Ganges river basin. The Indus River is important for the 160 million people of Pakistan and supports 80% of its 21.5 million ha of cropped area. The district is also a centre of significant biotic levels uncomplicated with the Arabian Sea, particularly the part close to the watershed. Indus River Delta is one of the most productive zones of freshwater fauna and a hub of water bird sites (Abro et al., 2024).

The Indus River more accurately called the River Indus is unquestionably vulnerable to climate change as 80% of its water originates from snow and ice melting. Temperature influences how fast glaciers melt and therefore gives more water in the dry/ warm years and less water in the cool years. Those river catchments which contain a fairly significant volume of glacial meltwater usually record relatively moderate fluctuations in water streams (Young et al., 2021). Most of these rivers will lose the glaciers which check the flow of water as Climate continues to warm. Hence depending on glacier water, communities will likely experience the worst water dearth quantity, fluctuations and possibly more excessive flooding as well (Merz et al., 2021).

According to (Azam et al., 2021), the Indus possesses the highest dependent ratio of 70-80% of its water from the Himalayan glaciers of all the Asian rivers. This is twice the total of water they offer the Ganges (30-40%). 23 percent of the total water coming from

the Himalayan glaciers is contributed by China where the upper Indus is located providing 44.8% of fresh water. Due to over-abstraction for agriculture, the irrigated Indus Delta is already experiencing a scarcity of accessible water and saltwater intrusion is already occurring in the delta. Like most Asian rivers, the Indus River water per capita in 1995 was below the undefined minimum standard for sustainable water use and is further expected to be reduced by 2025 (Strong et al., 2020).

Maximizing the quality of riparian forests is useful for the mitigation of climate change effects on river organisms. They afford protection from the sun and variations in temperature, they can dampen impacts associated with the occurrence of several storms per day for a short duration and can naturally control water run-offs. Global warming will worsen the effects that deforestation has on water regulation. Currently, the Indus system is strong enough to manage shortfalls of between 10 and 13 per cent of river flows, but when the river flow declines to 15-20% below average, irrigation shortfalls result. As a consequence, climate change is as sure to aggravate the difficulties of irregular and low flow (Podger et al., 2021).

Rising Temperatures and Drought Risk

Global climate change will impact a broad range of sectors water resources, agriculture and food security, ecosystems and biodiversity, human health and coastal areas. Nearly all environmental and developmental challenges in Asia will be worsened by climate change. According to climate change forecasted rainy seasons may rise in most of Asia, especially during summer monsoon and, therefore serve to expand the place of floods in East Asia, South Asia and Southern Asia. Yield reductions in Central and South Asia could be as large as 30 per cent, which would result in very high levels of food insecurity in several countries. This is evident because through global warming it has been observed that glaciers in the Himalayas are melting (Romshoo et al., 2022).

This means increased risk of flooding, erosion, mudslides and GLOF in Nepal, Bangladesh, Pakistan, and north India during the wet season. Because the melting of snow coincides with the summer monsoon season, any intensification of the monsoon and/or increase in melting is likely to contribute to flood disasters in Himalayan catchments. In the longer term, global warming could lead to a rise in the snowline and the disappearance of many causing serious impacts on the populations relying on the 7 main rivers in Asia fed by meltwater from the Himalayas. Throughout Asia, one billion people could face water shortages leading to drought and land by the 2050s (Baig, 2024).

Increase in Floods and Extreme Weather Events

Climate change effects will be directly experienced through water; the world ecosystem and livelihoods. True to this, Pakistan is a water-scarce country ranking 14 out of 17 extremely high water-risk countries. Climate change in the form of increasing temperature and changes in the frequency, intensity and variability of precipitation is expected to affect rainfall, snowmelt, river discharge, groundwater and water quality in Pakistan. It can mean a rise in both, inter-partite and intra-partite disagreements over water management agreements (Raupach et al., 2021).

Impact of Extreme Weather on Communities and Infrastructure

As per a report of the Global Climate Risk Index, over the last 22 years, the most vulnerable countries of the world include Pakistan for which 10000 people have died due to climate change and 173 extreme weather events caused 4 billion dollars in losses. Using climate change as a threats to water resources, which they are, evidence is available in terms of changes in monsoon patterns, receding glaciers, rising temperatures, and fluctuation ins (Amrutha et al., 2023).

The floods of 2010, 2011 & 2012 claimed human lives, infrastructure and normal life besides causing a direct economic loss which has set the economic wheels in Pakistan on average growth instead of achieving its potential growth rate of 6.5 per cent. Severe calamities included an excess of affects from drought in Tharparkar in Sindh and Balochistan resulting into loss of precious human lives and sources of earning (Salik et al ., 2020). Pakistan has been hit by its worst floods from mid of June 2022 as a result of record monsoon rains and melting glaciers and with a loss of over US$ 30 billion to the economy. Of the populations of 222 million, more

than 33 million have been impacted in one way or another and over 1,400 people have been killed. With more than eighty districts in the country have been officially declared 'calamity hit', out of total one sixty districts in the country, where one third is under water, thirty one are from Balochistan, twenty three from Sindh, seventeen are from Khyber Pakhtun Khawa, six from Gilgit Baltistan and three are from Punjab (Azam et al., 2022).

Historical and Recent Flood Events

Despite a population density of 2.8 percent in the global population, Pakistan has only 0.5 percent of renerwable water resources in the world. In other words while having fifth largest population in the world Pakistan stands 36 among 184 countries in total renewable water resources expect India that ranked 8 and Bangladesh that ranked 12 in 2017. Pakistan is a water stressed country and has a water availability per capita of less than 1000m3. Therefore in 1951 the flow per capita was 5260 but availability per capita went down to 'water vulnerable' in 1981 with less than 2500 cu.m, 'water stress' in 1990 with less than 1700 cu.m. Pakistan will experience droughts by 2025 as its per capita water resources is planned to become 'absolutely scarce' with less than 500 CIM (Okay, 2022).

Indus Basin provides 96% of total available fresh water resources in Pakistan and approximately 80% of fresh water is imported which is highly risky and critical. Upper Indus contributes 10%, 55% and 35% of total water of Indus. Upper Indus contributes more than 85 per cent of the total water of the Indus and is divided between Pakistan 53 per cent, India 33.5 per cent, China 6.7 percent and Afghanistan 6.3 per cent. analysed, it was found out that, about 80 per cent of the volume of annual stream flow in the tributaries of the upper Indus basin occurs in the summer season from mid June to mid September (Khan et al., 2020). From mid-June 2022, several parts of Pakistan were hit by unprecedented monsoon rains in different pulses till August last week. Updated recent flood records also show that by the end of August large parts of the country were submerged. The Indus that flows through the middle of the country flooded thousand of sq. km while the heavy precipitation also triggered Urban Floods, Landslides and Glacial Lake Outburst Floods (Kansal & Singh, 2022). Thanks to the Indus flood, a 100 km wide lake was formed in the south area of province Sindh which, along with the neighbouring province of Baluchistan, was now the most flooded area in the country. These rains were 726% of the usual rains for August for Sindh and 590% of that for Baluchistan since 1961 (Rose, 2023).

As a whole Pakistan received 243 per cent more rain than normal average during this period and becomes the record wettest August from the history of records started in the year 1961 (PMD 2022). The monsoon precipitations in question are scientifically described as being exceptionally high, while implemented in a country with high population density and high poverty rate, thus indicating a great extent of vulnerability to climate risks and potential changes in the likelihood and intensity of such events. The flooding inundated more than 130 districts across the country ensnarling the lives of more than 33 million people, washing twenty one thousand residential buildings and destroying 1.7 million homes, while claiming the lives of almost 1500 people (NDMA 2022, VOA News 2022). On August 25 the government declared national emergency. Losses are expected to be higher than initial estimations of about US$ 30 billion with a definite spiral of the economic impact in the coming were roads, 269 bridges and 1460 health-related facilities (OCHA 2022b).Among these losses, 18 590 schools were damaged (Save the Children 2022), 750 000 livestock were killed (NDMA 2022)

Economic and Health Consequences of Flooding

Food crops which are believed to be lost in combination with the war in Ukraine and summer heatwaves also amounts up to around US$ 2.3 billion (Pryshliak et al., 2023). It also causes a significantly higher rate of disease infection because flood water, even if stagnant, is a carrier of germs, and with so many people being moved out of their homes, it is difficult to maintain. As we know, across Sindh and Balochistan, disease spread through water such as diarrhoea and cholera, skin and eye infections malaria and fever have increased (IRC 2022). Pakistan is ranked top on the list of countries that stand to be affected most by climate change according to German watch 2021 and has had previous floods, the last major one being of 2010 (Mohr et al., 2022).

Pakistan is in a position where two precipitation carrying weather systems exhaust themselves and

break-the monsoonal rains from east and southeast during summer, and the westerly disturbances originating from the Mediterranean Sea during winter. As highlighted from existing literature, climate change has been evidenced to contribute to an increase in the variability of these systems (Douville et al., 2021). These either in space or time add to making the country more vulnerable repetitive such extremes. In particular, Pakistan is a low-middle income country with high vulnerability, but low readiness. According to the Notre Dame Global Adaptation index it estimates that Pakistan is the 32nd least ready country out of 181 to deal with climate change.

Health Implications of Climate Change

According to (Zhao et al., 2022) Effect of Global Climate Change on Human Health Global climate change has great negative effects on the health of people in Pakistan. Climate change is a cause of stress, trauma and diseases that cause mental illness, reduced productivity, as well as death.

Being located in the south, PG, Pakistan faces inland river floods almost every year, although in different measures, given increased sea levels, silting in water ways. The people who got affected by the floods in a year from 2010 data can be established to be over 714, 800 of the Pakistanis. According to the prediction of global change, climate change will bring about 1.5 million more people who will be threatened by flood and change in the socioeconomic status of the country will affect 638000 people by 2030. However, flooding also has other impacts on health in an indirect way owing to reduced crop production (food crops), occurrence of an epidemic, stress, and population shifting to urban areas respectively (Dagar et al ., 2023).

Risk of Infectious and Vector-borne Diseases

Fluctuations of temperature, precipitation and humidity proved to exert a very significant influence on the life cycle and development rates of microorganisms and disease carriers. As a result, the spread of water and foodborne illnesses is high after the rainy and flood period. Cholera, diarrhoea, hepatitis A, and typhoid are among those diseases that are mainly spread through contaminated water sources in the country. In the period 2010 - 2015, Pakistan experienced severe floods due to which thousands of people were killed especially those dwelling at the banks of the rivers of this country. Besides polluting the freshwater, these floods gave rise to several thousand ponds of still water which became breeding grounds for vector insects, bacteria and toxic algae (Mishra, 2023).

Pakistan has experienced different dengue outbreaks within the last ten years. In 2011, Lahore contributed with 10.6% having more than 350 fatalities out of more than 22,000 reported cases. Dengue fever is another disease, which is said to be common in the country year 2019, over 44,000 people were affected by this fever followed by scores of deaths.

Moreover another type of viral disease, Zika is also known to be common in the country. Although clinicians focus on the dengue virus and chikungunya virus, Zika virus infections are also increasing rapidly in the country. It may be important to introduce Zika virus diagnostic tests into the clinical algorithm to identify the incidence of the disease spread by Aedes aegypti and A. albopictus mosquitoes (Ong et al., 2021).

Malaria is also one of the most important Vector diseases in Pakistan with approximately one million cases per annum, out of the two major parasitic species namely P.falciparum and P.vivax the latter contributes a major amount. A. stephensi and A. culicifacies are the recognized principal vectors in transferring this disease.Hepatitis contributes to 50-60% of acute viral hepatitis in the pediatric population of Pakistan. According to the Pakistan Demographic and Health Survey Report 2012, Pakistan has the highest burden of typhoid fever in Southeast Asia with an estimated incidence rate of 451.7 persons per 100,000 population per year (Muhammad et al., 2020).

This is a waterborne and water-washed illness resulting from the ingestion of Salmonella typhi and Salmonella paratyphi organisms.Contaminated water is, therefore, usually how the organism is transmitted in many of the food-born outbreaks of this ailment. The development of extensively drug-resistant strains of this organism continues to be a major threat to the health of the people of Pakistan (Akram et al ., 2020).

Impact of High Levels of Pollens, Allergens and "Smog"

High temperatures help augment the number of polens and alergens in the air which make life unbearable for allergy sufferers. Transport, industrial emissions and crop residue burning are amongst major sources of pollution and central Punjab has almost become used to its 'smog' before autumn and winter seasons. Some particular days the air quality index can reach 600 in the worst case scenario. It is essentially always hazy with very bad air quality. This air pollution enhanced the levels of pollens, and allergens, prompting high prevalence of respiratory ailments for instance; asthma, hay fever, allergies, and eye diseases (Ibrahim et al., 2021).

Impact of Heat Waves and Natural Fires

As a result of which, now heat waves are much more frequent in the cities of the country. Scorching heat in Sindh and Punjab can lead to many health problems such as dehydration, formation of kidney stones and heat stroke. For instance, in Karachi alone more than 1200 people died from heat stroke in the year 2015. Natural fires also occur in woods especially during very hot weather a situation that kills wildlife and plants (Cassidy et al., 2022).

Impact on Food Security and Human Nutrition

Because agriculture is the main commodity in most countries today, the CO2 in the environment and the oscillations in weather change decrease the quality of the food crops available in the markets. Global warming also causes drought incidences and, therefore, hampers the availability and sources of food products. This leads to food insecurity and subsequently malnutrition. The other emerging risk factor affecting food security has been the recent (May 2020) attacks of locusts due to changes in climate in Africa and Asia. In its natural habitat, such an attack is devastating to the crops and leads to a massive destroyer of farming produce (Demis & Yenewa, 2022).

However, high population density and increased inequality in income assist in escalating the impact of threats. In a country where nearly a third of the population lives under the poverty line, such factors are disastrous for the people at large who may go even a step lower in terms of fulfilling the basic need of food in their lives. Consequently, there is an augmentation of the number of people suffering from malnutrition in the country. The poverty rate in Pakistan according to international standards in 2013 was 6% making the $ 1.9 per day poverty line 11.2 million Pakistanis living below and 68.2 million Pakistanis were living below the $ 3.1 per day poverty line (Iqbal, 2020).

All this has enhanced poverty hence affecting the health of the mass and making them prone to the simplest diseases. The worst effect of the food insecurity in the country is undoubtedly that there has been the 'growth stunting' of children in Pakistan and it is listed among the countries with higher rates of malnutrition among the developing world. A cross-sectional analysis of the last National Health Survey showed that the prevalence of children stunting in Pakistan was 31.5%; wasting 10.5% and underweight 45%. These are food insecurity, inadequate complementary feeding, low birth weight due to the poor diet of the mother during pregnancy, poor breastfeeding, low income and infections. These children are predisposed to growth development and have tremendously weak immunity (Bater et al., 2020).

Impact on the Development of Chronic Diseases

Pakistan is one of those countries that surprisingly holds the highest estimated prevalence rates of CVD and DM. Although there is no direct evidence that links climate change with cardiovascular diseases, there are several lines of evidence in the literature that point in that direction. Major climatic change contributors to cardiac challenges are heat and nutritional status. Indoor and nearby home pollution culminating from the use of biomass or coal as a source of cooking fuel. Women and children are often victims of indoor air pollution (Wu , 2021).

Cardiovascular diseases and chronic obstructive pulmonary disease are known to have caused deaths among women because of this pollution. Acute lower respiratory infections because of household pollution have been calculated to cause 52% of 68,200 deaths of children in Pakistan. Climate Change and Health in Pakistan 5 According to the International Diabetes Federation in its 2012 report food insecurity & malnutrition, increased temperature, heat waves & air pollution, and weakened health systems due to climate change are associated with the Global diabetes epidemic (Vallianou et al., 2021).

Strategies for Mitigating Climate Change in Pakistan

Adaptation and Mitigation

WHO has reported that Pakistan is at present involved in practising projects related to health adaptation to climate change and is working on methods to establish its institutional and technical capability to address the effect of climate change on health (Antwi-Agyei & Stringer, 2021). However, the adaptation measures are confronted with various challenges which include: an economy which is primarily agricultural, and less technologically and scientifically developed, lower ability to innovate, negligible financial and institutional ability, and somewhat weak political will among the policymakers and the society to combat it in letter and spirit.

The Pakistan's National Climate Change Policy (NCCP) was formulated in 2012.Assessment of adaptation needs has been established to stand between $7 billion and $14 billion annually or the whole year rating needed for that nation. After the issuance of NCCP, other policy documents were issued by the Government of Pakistan such as "Framework for Implementation of Climate Change Policy (2013)", and "Work Program on Climate Change Adaptation and Mitigation in Pakistan" to guide coordinated efforts in cumulative efforts towards building climate resilience at both national and sub-national levels. The main institution of climate change in Pakistan is the Ministry of Climate Change. It was established in 2010 by the Ministry of the environment following the 18th amendment to the Constitution (Khayam & Ahmad, 2020).

Another important institution under the Ministry of Climate Change consists of the National Disaster Management Authority.Based on the major climate change effects including reduced river flows, declining availability of water for hydropower generation, increasing temperatures and mortality due to heat waves, high floods due to unseasonal rains, sea intrusion into the Sindh delta increasing food insecurity due to erratic weather patterns several adaptation options have been found. These include; breeding crop varieties that are less sensitive to droughts and pests, enhancing the water system regimen and efficiency, a new approach to watershed management, afforestation of water catchments, construction of another broad water storage base, a turning to renewable power excluding the fossil, constructing dykes or water walls among others (Fanchi , 2023).

But there is very little adaptation for health in this report. WHO suggests the formulation of climate change policy in nations that focuses on the effects that climate change has on health. This should include such activities as how to enhance the climate resilience of health facilities, or how data is collected in a one health IDSR system. On the issue of climate change adaptation, this paper presents the following challenges: For instance, in climate change adaptation, there are no positive models to emulate; all work concerning adaptation is underfunded, inadequately coordinated, and managed; and very little ability to build resilience among the poorest populace (Willitts-King et al., 2020).

Furthermore, there is very scarce donor funding at the international level for specific projects in the field of climate change and health. There is also a dearth of health-climate Change interfaces in the role of the health sector in Climate change mitigation for instance in power generation . However, the problem of concern is that they don't work in harmony with the provincial governments on climate change matters to implement such issues. To achieve a good course of action, all the stakeholders including the local governments must combine their efforts to address the climate change and health issues in the country (Booth et ai., 2020).

Adaptation and Mitigation Efforts by non-Government Sector

Despite the fact the country has limited resources it has a civil population within the private sector who are also in the provision of service to the affected masses due to climatic change. At that time there were scores of NGOs which extended support to NDMA in dealing with the aftermaths of the massive 2005 earthquake in the North Punjab, Azad Kashmir and Khyber Pakhtunkhwa and the 2010 flood in the country. There were several relief camps put up in the disaster area to help provide for the basic health requirements of the shocked populace. Focusing on the fact that one of the most neglected health sectors in the country is the sector of mental health, Pakistani psychiatrists worked on the challenges that arose after the floods of 2010 (Iqbal ,2020).

It was expected that they would restore hope and rebuild confidence and integration; reduce helplessness and hopelessness and depression prevailing among flood-stricken people. Nevertheless, there is a lot of work to be done about such activities targeting other forms of climate hazards, and the case of droughts is an excellent example. Another successful strategy practised in some countries is the "building of social capital" through reinforcement of processes that assist communities in pursuing the common good that is often eroded in disaster and climate hardship. The strategy should be, "community and family-centred" to enhance mental health practices in the rural communities that face drought (Darracott et al., 2022).

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