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Evaluating the Economic Impact of Climate Change in Pakistan: A Content Analysis of Global and National Climate Reports (2015–2020)

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Abstract

Pakistan considered as most affected countries by the adverse consequences of climate change with significant implications for its economy. This study investigates the economic impact of climate change in Pakistan through a content analysis of global and national climate reports published between 2015 and 2020. The research aims to uncover how climate-induced economic challenges are represented, prioritized, and addressed within major climate documents produced by international organizations (such as the IPCC, UNDP, World Bank etc) and Pakistani institutions (including the Ministry of Climate Change and national planning bodies).

Through a systematic coding and thematic analysis approach, the study identifies key economic concerns such as loss and damage, productivity decline, rising public expenditure on disaster management, and the vulnerability of critical sectors like agriculture, water, and energy. The results indicate an increasing convergence between global and national narratives emphasizing climate change as an economic crisis rather than solely an environmental issue. This research provides valuable insights into the discursive evolution of climate policy and economic framing, offering recommendations for more integrated and proactive economic adaptation strategies in Pakistan.

Keywords: Climate change, economic vulnerability, Pakistan, content analysis, national policy, global discourse, adaptation strategies

Introduction

Pakistan is on sixth most populous countries with a size of around 220 million with an average population growth of 5.28 million people annually. As predicted it became the world's 5th largest populous country in the year 2050 if the growth rate would become constant. The Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Report (AR-5) for Asia revealed that the climate change threatens the agriculture-based economies, particularly Pakistan, arises from different landscapes, important geographic locations, socio-demographic trends, and economic factors.

Pakistan lacking in modern or required adaptive capacity that also determines the vulnerability profile of the country through a nasty circle of poverty. The climate change estimates reviled by the AR-5 that the overall warming and increase in temperature likely to be above the set global means, impacting the melting of glaciers and changing the overall precipitation patterns. This significant impact of productivity and efficiency of water-dependent sectors, such as agriculture and energy are the major sources of the country's economic indicators (Rashid, 2021, p. 1).

As same the climate change raises concerns for Pakistan with its enormous social, environmental, and economic impacts. Over the years, Pakistan is largely exposed natural hazards such as frequent floods, droughts, and cyclones. These natural and man-made environmental hazards, combined with the overall vulnerabilities to extreme poverty, exclusion, and inappropriate political decisions made the people more vulnerable to the impacts of these natural and man-made hazards on their well-being (Rafiq & Blaschke, 2012; Ajani & van der Geest, 2021). As an agrarian state, Pakistan is also more vulnerable to climate change. This would impact the cropping patterns and productivity returns, as a result of these weather changes that will badly affect the poor and rural communities of Pakistan (Syed et al., 2022).

It has been proven and the evidences indicate that the CO₂ content of the atmosphere could double by the middle of the current century which already been occurring and that climate change has begun. Measurement records indicate an increase of $0.6 \pm 0.2^{\circ}\text{C}$ in global average temperature since the late 19th century has affecting the earth adversely. If nothing is done to reduce emissions as most of the developed country not yet sure where and how to start, current climate models predict a global warming of about 1.4-5.8 $^{\circ}\text{C}$ between 1990 and 2100. Carbon dioxide is the most significant one, accounting for 49% of global warming. (IPCC 2007).

While scientific and policies discourse around climate change have grown drastically over the last decade, it is direly need to critically examine how these discourses frame the economic dimensions of climate change, especially in the context of vulnerable nations. Climate reports, whether published by global institutions like the IPCC and World Bank or national agencies. Ministry of Climate Change (MCC) plays an essential role in shaping public policy, development priorities, and funding decisions.

This empirical study aims to evaluate how the economic impact of climate change in Pakistan is constructed and represented in climate reports published between 2015 and 2020. By applying content analysis, the research investigates dominant themes, patterns, and shifts in economic framing over time, comparing global and national perspectives. Essentially, for understanding of this narrative not only for assessing knowledge production and policy alignment but also for identifying gaps and opportunities in Pakistan's climate resilience strategy.

Review of Literature

Landscape of Pakistan

Pakistan has diverse landscapes such as the "Makran" coastal regions of "Karachi and Gwadar" which are located in Baluchistan province, the "Thar and Thal" deserts of "Sindh and Punjab" respectively, and high locales in KPK and Baluchistan. While the other side, higher mountains are on the country's northern side of Pakistan which included the region of "Gilgit-Baltistan". Due to these regional and geographic variations, climate change varies from region to region and area to area like higher rainfalls in the northern regions and more dryness in coastal areas, etc (Vivid Economics, 2013).

Economical Dependency of the State

The economy is more likely dependent on agriculture and livestock, and the change in the overall weather affects the water supply to the crops when need. Unexpected rains fall damage crops and farming patterns (Shroder, 2002; Rengel, 2003). So, climate change and extreme weather conditions endanger Pakistan's food safety and security. As per reports, Pakistan has been hit by almost 152 big weather disasters that killed around 9989 individuals and the lost cost was around 3.8 billion dollars till the present year (Ashraf Hussain et al., 2022, p. 9196).

Similarly, dry land areas, also included, the arid and semi-arid regions, more susceptible to these climate change aspects. These regions are already come across significant water shortages and rising-temperature issues due to climate change. The cause is the larger populace of Pakistan is economically and socially dependent on the primary resources, due to any agricultural country (Mustafa, 2011, p. 100)

IPCC reports and Pakistan

The IPCC reports explain that the process of reduction and modifications positively or negatively affects productivity related to other societal goals; human health, food security, environmental and economic concerns issues (IPCC, 2012, p. 5). Concisely, climate change is a major issue that has set-off serious other challenges for humanity across the world and more concerning issue for Pakistan. It has also found that climate-change causes results in the form of extreme weather and climate events in Pakistan. As observed the extreme rise in temperature, varying seasons, changes in the pattern of precipitation and snowfall are intensifying sea level, high melting of glaciers, urban flooding, lessening sea-ice levels, and posing many other severe threats to the world as well as Pakistan (Shahid & Adnan, 2021, p. 224).

Consequently, climate change in Pakistan is caused by both natural and men-made factors. As claimed in the report the foremost roots of climate change is the excessive emissions of dangerous gases such as methane, carbon dioxide, nitrous oxides, etc are emitted by industrial, commercial, and domestic activities (IPCC, 2014).

Global Industrial Revolution

Due to the Industrial Revolution in the world, largest contributor to the increase in global warming is the excessive emission of carbon dioxide, followed by methane. The CO₂ concentrations have also increased from 278 parts per million (ppm) in the year 1960s to 401 ppm in 2015 respectively which accounted for 44% overall increase percentage. Additionally solar radiation is also greatly influenced by climate change in Pakistan, such as the variations in the sun's energy, which has impacted the hotness level and climate patterns. The unpredicted changing patterns of monsoon rains are also a result of seasonal wind patterns (Chaudhry, 2017, p.9,12 & 29).

Furthermore, the Indus River system and its tributaries are crucial for Pakistan's water resources and agricultural production. Changes in the flow and volume of water in the Indus River system, which can occur

due to natural factors like snowmelt and glacial melt, can impact water availability and the overall climate in the region

United Nations and World Bank Reports

Pakistan is among top ten countries in the world, where climate-change is having the most negative effect on the livelihood of the common population. Although, climate change has affected almost every country in South Asia, particularly Pakistan, in terms of climate vulnerability and converse effects on the livelihood of people. (Ashraf et al. 2022, p. 9195)

This is not but less usage of modern techniques to counter climate threats, least informed people about the negative implications of climate change. Mostly people in Pakistan, not even considered climate change as a threat to humanity (World Bank, 2022). Beside these realities, the physical infrastructure of Pakistan is not well designed to deal with the climate-relevant threats multi droughts; earth quacks, floods, hurricanes, avalanches, and other types of disasters hit the country. Even though, Pakistan has no yet well informed and integrated national-level plan or strategy to counter the climate change related threats which have been already identified by many international organizations (UN & World Bank) reports (Islam et al., 2016; Rengel, 2003).

METHODOLOGY

This study examines the impact of climate-change on Pakistan. It also proposed solutions through existing evidence from the literature of last 5 years (2015-2020), both nationally and internationally perspective. Aiming to explain all aspects, the qualitative research approach was adopted. The secondary data was collected from research papers, books, and other related reports available on Google Scholar (Sutton & Austin, 2015; Irwin, 2013; Ruggiano & Perry, 2019). All these research papers and policy documents were collected and searched through keywords: "Climate Change in Pakistan", "Impact of Climate Change in Pakistan", "How to overcome the negative consequences of climate change in Pakistan", "Environmental Impact of Climate Change", "Issue of Climate change in Pakistan" etc. It was also revealed during searching all the data that majority of reports, research papers, and books were published after 2010. The final results of the work divided into some major themes such as phenomena of climate change, social impacts, and economic and environmental impacts of climate changes in Pakistan.

Further, these results also proposed some solutions to overcome the negative implications of climate change in Pakistan. For each climate change impact, maximum exploration of articles' abstracts was critically examined and investigated (Tullu, 2019).

Theoretical Framework

This study employees Framing Theory, Political Economy of Climate Change Communication, and Ecological Modernization Theory (EMT). All these interlinked frames help for explaining that how climate change and its economic impacts are interpreted, constructed, and communicated in both global and national climate reports.

1. Framing Theory

Key Scholar(s): Erving Goffman (1974), Robert Entman (1993)

Application in Study:

Framing theory is central to understanding how economic aspects of climate change are emphasized or de-emphasized in climate reports. It explains how specific narratives (e.g., economic loss, climate finance, or development co-benefits) are selected and made salient to shape public and policy perception.

- The study uses Entman's (1993) framing functions:

- Problem definition: What economic problems are attributed to climate change?
- Causal interpretation: Who or what is seen as responsible?
- Moral evaluation: Are these impacts seen as unjust or inevitable?
- Treatment recommendation: What economic or policy solutions are proposed?

Justification:

Climate reports play a powerful agenda-setting role. Analyzing their framing reveals how climate change is positioned as an economic risk, a development challenge, or a call for sustainable investment in Pakistan.

2. Political Economy of Climate Change Communication

The perspective of Political Economy of Climate change communication draws from media and development studies to explore that how economic interests, institutional power, and geopolitical structures influence the content and language of climate discourse. It also evaluates how donor agendas, institutional mandates (e.g., World Bank vs. Ministry of Climate Change), and funding sources shapeup and prioritization of economic impacts. It investigates potential asymmetries between global and national narratives. This specific lens of exploration helps uncover why the certain economic frames dominate and others are marginalized, exposing power dynamics behind knowledge production in climate discourse.

3. Ecological Modernization Theory (EMT)

Key Scholar(s): Arthur Mol, Gert Spaargaren

Ecological Modernization Theory (EMT) is used to interpret how economic responses to climate change are framed in terms of Green technology, Market-based solutions, Climate-resilient infrastructure and Sustainable development. There are many reports advocate for economic transformation and green growth as a dual response to climate risk and development goals. This specific theory provides a theoretical base to assess these optimistic narratives and their alignment with Pakistan's realities.

Research Questions

RQ1. What economic impacts of climate-change in Pakistan are documented in global and national climate reports published between 2015- 2020?

RQ2. How do global and national reports differ in their framing, quantification, and assessment of climate-related economic losses and risks?

RQ3. Which economic segments and dimensions of vulnerability obtained the maximum attention in these reports?

RQ4. How do these reports address adaptation costs, climate finance, economic recovery, and policy responses to Pakistan's climate-related economic vulnerability?

Research Objectives

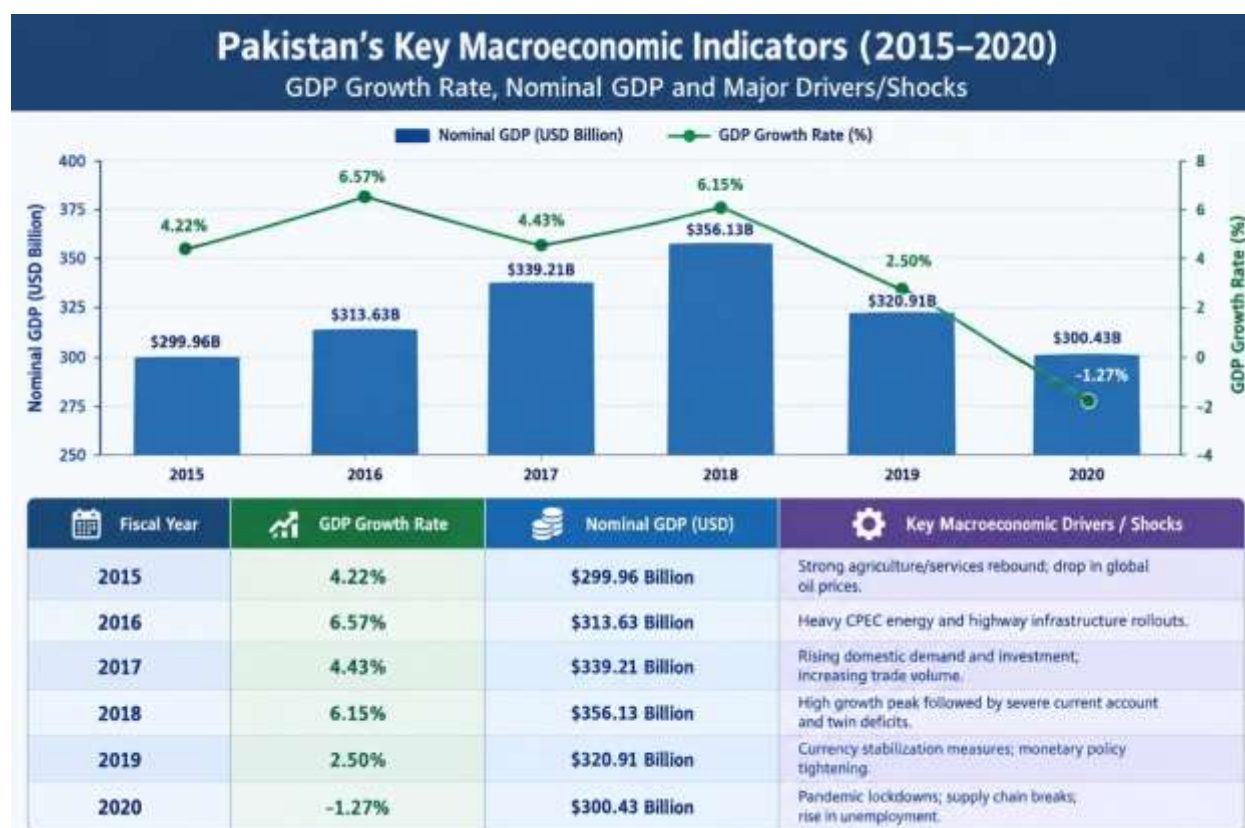
1. To identify and categorize the economic impacts of climate change in Pakistan documented in nationally and globally climate reports published between 2015 and 2020.
2. To examine the relative emphasis placed on different economic sectors and dimensions of vulnerability in the selected reports.
3. To compare global and national reports in their framing, quantification, and assessment of climate-related economic losses and risks.
4. To analyze how the selected reports address adaptation costs, climate finance, economic recovery, and policy responses to climate-related economic vulnerability in Pakistan.

Research significance

Climate change poses significant challenges to Pakistan's economic development, particularly through its implications for agriculture, water resources, infrastructure, livelihoods, and public expenditure. Considering these challenges need exploring not only the economic impacts documented in climate reports but also investigate how institutions identify, measure, priorities, and communicate those impacts.

This study will contribute to climate change and environmental communication research by systematically analyzing global and national reports on Pakistan's economic vulnerability during 2015–2020. By comparing institutional perspectives, the research will identify which economic sectors and risks receive the greatest attention, how monetary losses and financial requirements are reported, and where differences or gaps occur in the assessment of climate-related economic consequences.

The research will also contribute to the political economy of climate change by examining how reports discuss the distribution of economic vulnerability, adaptation requirements, climate finance, and policy responsibility. Its findings may help researchers, policymakers, and development practitioners better understand the strengths and limitations of existing institutional assessments and identify areas requiring more consistent economic evidence and policy attention. Rather than independently estimating Pakistan's total climate-related economic losses, the study will assess the scope, emphasis, and comparability of the evidence presented in the selected reports.



The rising temperature leads to floods and land sliding in hilly regions. Since 2010 five successive floods and landslides have caused more than 25 billion dollars of economic setbacks for Pakistan. These floods have destructed the health infrastructure, irrigation system, land, and educational infrastructure as well, which

required billion of Pakistani rupees for rehabilitation and resettlement purposes. Annually, the economic cost of floods and land sliding is equal to 5% of the total GDP of Pakistan. If added the overall inflation fluctuations due to these floods, it reached almost 20% of the total GDP shared. In comparison, the price of managing to alleviate atmospheric GHG levels, with a range of 500-550 ppm of CO₂ equivalent is counted to be almost 1-2% of the global GDP annually. By the end of the year 2040, the average temperature across Pakistan was projected to be increased by 0.5 degree Celsius, and 8-10 percent of all crops, or 30,000 rupees per acre will be lost. (Ashraf Hussain et al., 2022, p. 9204-05).

Table: Climate Change and Economic Implications in Pakistan: Review of Previous Studies (2015–2020)

Reference	Methodology	Reference
Akram and Hamid (2015)	National-level econometric analysis of Pakistan using data for 1973–2011; examined the relationship between temperature and economic growth and sectoral productivity.	Temperature was negatively and significantly associated with GDP and productivity in agriculture, manufacturing, and services. The reported negative relationship was strongest in agriculture.
Mujahid (2016)	Autoregressive Distributed Lag (ARDL) cointegration model using Pakistan time-series data for 1981–2014 to investigate the short- and long-run relationship between flood shocks and output growth.	The study identified a long-run relationship between output growth and its determinants, including agricultural growth, non-agricultural growth, investment, and flood-affected areas. Its reported results indicated a significant relationship between flood shocks and output growth, particularly in agriculture.
World Bank (2019)	Country-level environmental sustainability assessment drawing on existing economic, environmental, and disaster-risk evidence.	The assessment documented Pakistan's exposure to climate-related disasters and associated economic losses. It discussed the effects of floods on infrastructure, agricultural production, livelihoods, and development, highlighting the disproportionate burden on poorer populations.
Economic Effects of Climate Change-Induced Loss of Agricultural Production by 2050: A Case Study of Pakistan (2020)	Integrated global climate and crop models with an economic model, using DSSAT-based CERES-Wheat and CERES-Rice and APSIM crop-model outputs to estimate wider economic effects.	Under the study's modelling assumptions, climate-related reductions in wheat and rice production were projected to reduce Pakistan's real GDP by approximately US\$19.5 billion by 2050, alongside higher commodity prices and lower private consumption. These are model-based projections, not observed losses during 2015–2020.
Khayyam and Noureen (2020)	Case study of flood impacts on vulnerable rural communities in Pakistan's Hazara Division, examining causes, impacts, aftermath, and livelihood patterns.	The study examined how flooding affected rural livelihoods and community vulnerability, providing local-level evidence relevant to the socioeconomic consequences of climate-related disasters

Table: Global and National publications for Climate disasters effects

Institution category	Institution	Number of reports	Publication years covered	Report type
Global	IPCC	01	2015	Sixth Assessment Report (AR6)
Global	UNEP	04	2015-16	1. Emissions Gap Report 2015 2. The Financial System We Need (2015) 3. UNEP Frontiers 2016 Report 4. Lead Paint Alliance Activity Report 2015-2016 5. UNEP Annual Reports (2015-16)
		01	2017	Annual Report 2017
		04	2018	1. Emissions Gap Report 2. Adaptation Gap Report 3. Global Status Report 4. Single Use Plastics Report 5. UNEP Annual Reports 2018
		08	2019	1. Global Environment Outlook 6 2. Global Resources Outlook 2019 3. Emissions Gap Report 2019 4. Environmental Rule of Law: 5. First Global Report 6. Greening the Blue Report 2019 7. Measuring Progress: Environmental Dimension of the SDGs 8. Quarterly Reports to the Committee of Permanent Representatives (CPR)
		01	2020	UNEP Annual Reports 2020 https://www.unep.org/resources/unep-annual-reports
Global	World Bank	01	2015-16	World Bank Economic report https://www.worldbank.org/en/publication/gfdr/pastreports
			2016-17	
			2017-18	
			2018-19	
			2019-20	
National	Ministry of Climate Change and Environmental Coordination or its predecessor	04	2015-20	Strategy / assessment https://www.mocc.gov.pk/Publications
National	National Disaster Management Authority	03	2015-20	Disaster / damage / response report https://www.ndma.gov.pk/storage/publications/July2024/HR3aQWJEvYVu7tO3j3AW.pdf

Table: Results and report of Economic Impact of Disaster

Economic impact theme	What to record	Results to report
oAgricultural losses	Crop damage, livestock losses, reduced productivity 2015-16 & 2018-19	1. The agriculture sector recorded a negative growth of -0.19% (with important crops plunging by over -7%), primarily driven by a severe crisis in the cotton crop due to pest infestations and unfavorable weather. https://www.researchgate.net/publication/398483690_Post_Harvest_Losses_in_Pakistan Financial Impact: This represented an economic drain of approximately PKR 345 to 523 billion annually during those years, heavily impacting staple foods and perishable items like wheat, rice, fruits, and vegetables. https://www.researchgate.net/publication/398483690_Post_Harvest_Losses_in_Pakistan
Flood and disaster losses	Infrastructure damage, asset destruction, reconstruction costs	1. 2015 Floods: Heavy monsoon rains and glacial lake outburst floods (GLOF) starting in July 2015 affected Khyber Pakhtunkhwa (KP), Punjab, Balochistan, Gilgit-Baltistan, and Sindh, resulting in over 230 reported deaths, more than 1.5 million people affected, and widespread damage to crops and local infrastructure. https://adore.ifrc.org/Download.aspx?FileId=118449 2. 2019–2020 Monsoons: Severe monsoon spells—particularly in Sindh, Balochistan, and urban centers like Karachi—caused flash and urban flooding. The 2020 monsoon season alone resulted in over 400 deaths and the damage/destruction of more than 200,000 homes, with Sindh bearing a major share of the displacement impact. https://earth.org/data_visualization/satellite-snapshot-of-the-heavy-floods-in-pakistan/
Water-related impacts	Water scarcity, irrigation disruption, water-management costs	1. Agricultural & Conveyance Losses: Over 90% to 94% of Pakistan's freshwater is consumed by agriculture, with more than 60% of water lost through unlined watercourses and field runoff. https://pide.org.pk/research/water-crisis-in-pakistan-manifestation-causes-and-the-way-forward/ 2. Per Capita Decline: Per capita water availability dropped steadily from over 5,260 m³ in 1951 down to roughly 1,017 m³ around 2015–2021, pushing the country to the threshold of severe water scarcity. https://qubafoundation.org/water-crisis-in-pakistan/
Energy impacts	Energy infrastructure damage, supply disruption, cooling demand	1. World Bank Report on Pakistan's Power Sector: Highlighted that Pakistan's inefficient power sector cost the economy \$18 billion annually (roughly 6.5% of GDP in FY2015), with unreliable power access costing households and businesses \$12.9 billion yearly. https://www.dawn.com/news/1451138

	2. Circular Debt Escalation Reports: Documented that Pakistan's power sector circular debt rose dramatically from PKR 450 billion in 2013 to approximately PKR 2.3 trillion by December 2020 (equating to roughly 5.6% of the country's total GDP). https://www.researchgate.net/publication/366691197_An_Overview_of_the_Current_Energy_Situation_of_Pakistan_and_the_Way_Forward_towards_Green_Energy_Implementation 3. Demand-Supply Shortfall Analyses: Noted a persistent electricity demand-supply shortfall ranging from 3,500 to 7,000 MW during the 2015–2021 window, causing heavy urban and rural load shedding (often 8 to 12 hours or more daily). https://www.sciencedirect.com/science/article/pii/S2211467X26001082 4. Industrial and Macroeconomic Impact Studies: Showed that the textile sector and other industries experienced output drops of 20% to 30%, while the industrial share of GDP declined from 24.8% in 2015 to 23.2% in 2021, alongside lost foreign direct investment and rising trade deficits. https://ojs.jdss.org.pk/journal/article/download/1156/1084		
Livelihood and health impacts	Lost income, labour productivity, health-related economic costs	Focuses on how 2015–2020 weather irregularities and accelerated glacier melt altered the Indus River flow, damaging agriculture which employs 42% of the population . https://reliefweb.int/report/pakistan/climate-change-impacts-health-and-livelihoods-pakistan-assessment	

Results and discussion

Globally, the financial cost of disasters is extremely high and also the alleviation process required higher expenditure. Pakistan foresee a plan to reduce 20% of the GHG projected up to the year 2030, subject to the availability of finances, and international grants to meet the cumulative cost amounting that is 40 billion dollars (Fawzy et al., 2020).

Country’s climate change improvement strategies adaptation requires as identified to range between 7 billion dollars to 14 billion dollars per year (Chaudhry, 2017).

Though, Pakistan is an agricultural economy already faced numerous difficulties due to climate change-related threats. This specific cultivation sector not only endure food security but also employed around 22% of the total workforce and contributed 23 to 25% to the total GDP of Pakistan annually (Mustafa, 2011, p. 109).

As same like other realities and issues, the large number of storms, floods, and frequent droughts in turn are exposing the country to threat of the overall socioeconomic losses such as minimizing agricultural output, loss of food crops and the land etc. Same as IPCC’s data revealed, climate change has decreased almost 30% of major crops yields due to water logging, high salinity, and continuous floods in Pakistan. The rising temperature day by day in Pakistan adversely decreases the fertility of the agricultural land.

CONCLUSION

Climate change has inversely affected the economic, social and environmental comfort of the population of Pakistan. Even though, the country trying hard to manage all hazard under its own capacity, while as an under-develop state the missing facilities and limited finance don't allow to put its all strength for the cause. Geographically, Pakistan is located at a higher risk area of climate change-related threats. Due to climate change, droughts, urban floods, land-sliding, cyclones, and earthquakes, have been observed in the last two decades. All these are not only affecting the economic life but also the social life of the people of Pakistan. Climate change increases the sea level rise, temperature level, intensity of the heat waves, and is dry in coastal areas as well. Though, Pakistan has signed many national and international agreements and projects to mitigate climate-related challenges, still failed to achieve the expected goals due to the lack of political deficiency and administrative inefficiencies. The mitigation strategies also required a large number of funds, due to lack of funds, and international support, Pakistan is unable to implement the adaptation strategies that have been targeted. Pakistan needs political and administrative commitment to implement adaptation strategies to mitigate the inverse impact of climate change. It also requires awareness creation among the general masses about the issue of climate change and its negative implications for Pakistan.

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