



Original Article

Effects of Climate Change on Communities Living and Economic Structure of Indus Riverine Areas of Dera Ghazi Khan

Sharjeel Saleem¹, Dr. Muhammad Ali Tarar² & Zona Khan³

¹Lecturer, Department of Sociology, Govt. Graduate College Shah Sadar Din D.G. Khan, Punjab Pakistan.

Email: nawabzada.sharjeel@gmail.com

²Associate Professor (Chairperson), Department of Sociology, Ghazi University, Dera Ghazi Khan,

Email: mtarar@gudgk.edu.pk

³Lecturer, Department of Sociology, Ghazi University, Dera Ghazi Khan, Email: zkhan@gudgk.edu.pk

ARTICLE INFO

Keywords:

Climate Change, Global Warming, Atmosphere, Economic Sustainability, Disaster

*Corresponding Author:

Sharjeel Saleem
nawabzada.sharjeel@gmail.com

ABSTRACT

Climate change is the most important issue of the top current issues that the globe is experiencing. Climate change is the most significant and hazardous issue not just for Pakistan but globally as well. Pakistan is one of the underdeveloped nations in South Asia and is ranked among the five nations that have been worst affected by climate change. Climate change has severely influenced both the development of human lifestyles and existence, together with food scarcity, wildlife destruction, and risky meteorological conditions problems. The objectives of the study were (1) to investigate the direct consequences of deforestation on the local ecosystem and (2) to examine how deforestation increases environmental changes. The study was delimited to people only in the Indus riverine areas in District Dera Ghazi Khan. All the people who are living in the Indus Riverine areas in District D.G. Khan served as the population of the study. A total sample size of 225 citizens was selected from District Dera Ghazi Khan. In the first stage, 3 Tehsils of District Dera Ghazi Khan e.g. (Dera Ghazi Khan, Kot Chutta, & Taunsa Shareef) were selected. In the second stage, 3 riverside union councils were selected from each Tehsil through a convenient sampling technique. In the third stage, 25 citizens were selected from each union council. Data was collected through an interview schedule and examined by 'The Statistical Package for Social Sciences' (SPSS). Obtained results indicate that climate change also happens in the community (99.1%), climate change decreases the local agricultural productivity (92.9%) and climate change has effect on the overall economic sustainability of the local community (95.5%). The bivariate analysis showed that more will be climate change vs less will be the agricultural productivity; less will the economic sustainability. So, all the hypothesis results are accepted after the analysis of the data.

Introduction

The word climate may be stated as an international environmental condition that can be detected by fluctuations in rainfall, temperature, pressure, and humidity in the atmosphere. Therefore, the phrase climate change states to an alteration in this environmental status by natural events or human actions. Irregular weather patterns, global warming, melting of glaciers, increasing the levels of the sea, and several other climatic incidences are produced by climate change around the world (NASA, 2018). Numerous expert investigators, professors, ecologists, and the community feel that the consequences of climate change might be detected via regular incidences of natural disasters such as hurricanes Irma, Harvey, and Maria. The constantly expanding effects of climate change require urgent consideration of the phenomena, and the public is required to participate in actions that encourage adaptation to climate change (Perkins *et al.*, 2018).

Pakistan is ranked among the top ten climate change-vulnerable nations (Ahmad *et al.*, 2020; Nadeem, *et al.*, 2022), wherever climate change is significantly harming the social and economic circumstances and food security of small watershed populations, especially in mount ecosystems (Ghani, *et al.*, 2013). The majority of remote watersheds experience increasing risks of extreme events (heat waves, droughts, and floods), changing weather patterns, high rates of population growth, declining water availability, and degrading natural resources, all of which harm farming communities' productivity and way of life (Siddique *et al.*, 2018; Kabir *et al.*, 2016). The agricultural output of Pakistan is predicted to expand in 2050 as food shortage and malnourishment reduce, climate change presents the most important risk to the food security of families who rely on smallholder farming on behalf of sustenance and livelihoods. Rising temperatures and irregular precipitation will threaten the construction of commodities via more severe drought, heat stress, and flooding situations. Small farmers' families in environment-susceptible regions are expected to experience an inconsistent amount of the harmful consequences of climate change (Ali *et al.*, 2021).

Climate change leads to a severe and rising risk to Pakistan, a nation already coping with numerous social, economic, and environmental issues. Pakistan is seeing a distinct pattern of climate-related consequences, including more frequent and severe heatwaves, irregular monsoon patterns leading to destructive floods and droughts, and the increased melting of the country's key Himalayan glaciers. These shifts have serious ramifications for Pakistan's agriculture, water resources, and energy security, which are intricately interwoven with the economy and lives of its primarily agricultural people. Additionally, metropolitan areas, notably Karachi, are experiencing greater susceptibility to the level of sea escalation and severe weather events (Fahad and Wang, 2020).

Climate change has severely influenced both the development of human lifestyles and existence, together with food scarcity, wildlife destruction, and risky meteorological conditions problems (Cramer *et al.*, 2018; Iram *et al.*, 2024; Asghar *et al.*, 2024). For the last 5 decennaries,

practically every nation has been making efforts. They were coming up with tactics to address the ecological impacts of anthropological actions (Ozcan *et al.*, 2020; Shehzad *et al.*, 2022; Huang *et al.*, 2024). Therefore, humans are already owed to nature (GFN, 2022). Pakistan produces green-house gases of less than one percent; nonetheless, among the top 10 Asian nations, it is the most important nation impacted by both global climate warming and climate change (Glibert *et al.*, 2014).

The consequences are momentous in Pakistan faces impacts, from its reliance on the environment for survival, limited adaptability, a dense population, poverty, and scarce economic resources. In times Pakistan has faced an escalation in the prevalence and strength of climate-related occasions such as unpredictable weather patterns, floods, glacier melting, insufficient rainfall, disease outbreaks, among crops and livestock, and air pollution. (Abas *et al.*, 2017). Additionally, climate alteration has significantly impacted on food supply and quality of Pakistan (Abid *et al.*, 2016). Pakistan is suffering from harsh environmental conditions, rising temperatures, and depleting H₂O supplies (Ali *et al.*, 2019). Pakistan may experience significant changes in its environment in the future years as a consequence of the rapid melting of glaciers, droughts, floods, and dwindling hydrological reserves. The temperature rises in Pakistan and will continue to rise consistently until 2050 (Hussain *et al.*, 2020).

Objectives of the Study

1. To examine how deforestation and climate change impact local economies, considering effects on agriculture, forestry-based livelihoods, and overall economic sustainability and
2. To investigate how deforestation increases environmental changes

Hypothesis of the Study

1. More will be climate change; less will be agricultural productivity.
2. More will be climate change; less will be economic sustainability.

Materials and Methods

The research was conducted in 2024 in the Indus Riverine belt region of District Dera Ghazi Khan. The District Dera Ghazi Khan contains a total of 89 rural union councils, (35 D.G. Khan, 24 Taunsa Shareef, and 30 Kot Chutta) among these 9 union councils were chosen for the conduction of the research. D.G. Khan (Drahma, Sabra Nachan, and Samina) Taunsa Shareef (Morejhangi, Nari-Janubi, and Downa), and Kot Chutta (Jhuk Utera, Hazara, and, Jhakar Imam Shah). The population of the research was constituted of the Indus River belt located in District Dera Ghazi Khan. The research was descriptive by design having a quantitative approach. A convenient sampling procedure was utilized in order to obtain an adequate sample size. The sample size was 225 respondents. In the current research, data was gathered from 25 respondents from each of the 9 union councils total of 225 respondents from the Indus Riverine belt areas in

District Dera Ghazi Khan. Data was collected through an interview schedule and analyzed using the Statistical Package for Social Sciences (SPSS). The present study employed bi-variate analysis, specifically Chi-square and Gamma tests.

Results and Discussion

The data pertaining to this study, titled " Exploring the Effects of Climate Change on Communities' Living and Economic Structure: A Sociological Study in Indus Riverine Areas of Dera Ghazi Khan" was collected, structured, and analyzed using the research methods elucidated in the preceding chapter. The analysis and interpretation of data are crucial components of scientific inquiry.

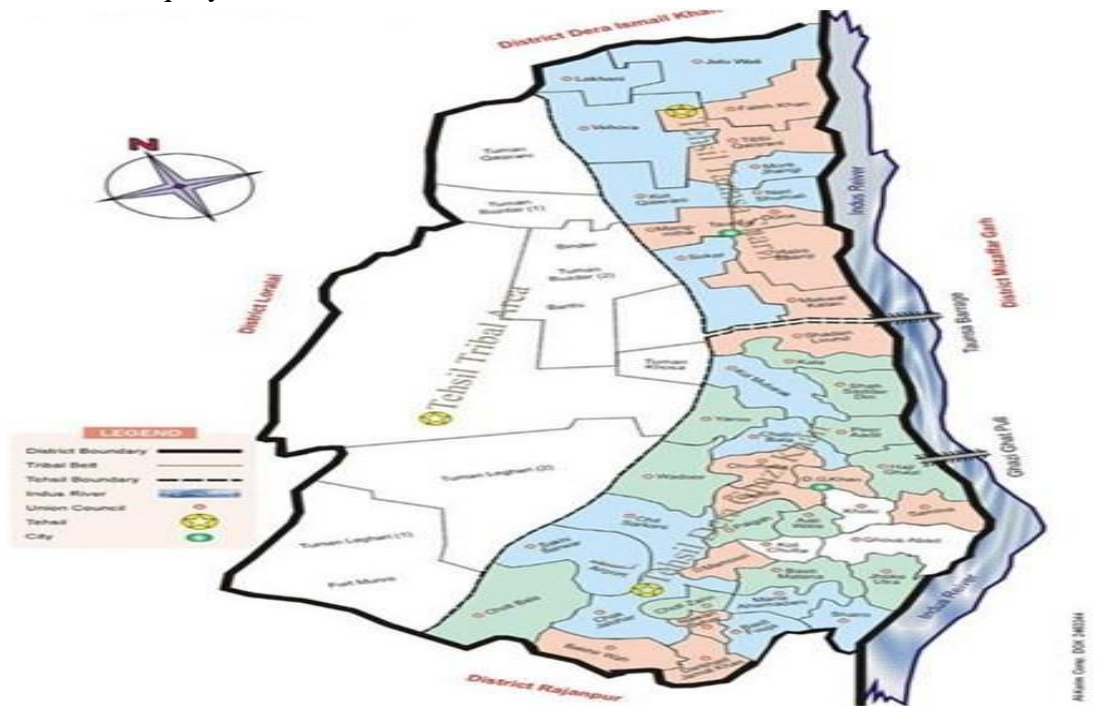


Figure 1: Map of district Dera Ghazi Khan showing the study sites

Table–1: Socio-economic profile of the respondents (N=225)

Demographics	Variables	F (%)
Age (years)	17-25	71 (31.6)
	26-34	95 (42.2)
	35-43	37 (16.4)
	44 & above	22 (9.2)
Education Levels	Illiterate	36 (16.0)
	Middle	31 (13.8)
	Matric	26 (11.6)
	Intermediate	56 (24.9)
	Graduation & above	76 (33.8)
Marriage Status	Unmarried	65 (28.9)
	Married	160 (71.1)
Occupation	Agriculture	63 (28.0)
	Poultry Farming	21 (9.3)
	Job	64 (28.4)
	Labor	17 (7.6)
	Self-Business	60 (26.7)
Main family income source	Agriculture	67 (28.9)
	Poultry Farming	52 (23.1)
	Business	54 (24.0)
	Job	52 (23.1)

Source: Field survey 2024

Age is viewed as the number of years for which a specific living individual has existed, and is usually recorded as the number of calendar years at the onset of birth. It is usually interpreted as a ratio variable because of several statistical advantages it has over other levels of measurement; For instance, measuring age as an ordinal variable will not give the distinction between two or more ages in a measured range that measuring age as a ratio variable will. The above table age age categories depicted 17 years to 44 & above years old. The majority of 42.2% of respondents were from the age group 26-34 years (adults), followed by 31.6% of respondents from the age group 17-25 years (emerging adults), 16.4% belonged to the age group 35-43 years (young adults) and 9.8% were from 44 & above years. It is evident from these results that adults from the 17-34 years age group found almost 74% of the study population whereas the rest of

almost 26.2% of respondents were from middle and old age adults. Knowledge is one of the most composite features that may influence a person’s perceptions and approach to viewing and interpreting a specific social process. Likewise, Kajembe *et al.*, (2012) pointed out that they too considered that an enhanced level of education was needed which was an essential component of gradually reducing the deforestation rates. Therefore the variable under consideration for investigation was ‘Educational level’ and the corresponding education data was presented by the researcher. The above table shows that the majority of the respondents’ 33.8% educational level was graduation & above, followed by 24.9% were intermediate, 11.6% were matric, and 13.8% were their level of education middle. While 16% of respondents were illiterate above table indicated the results. The majority 71.1% were married whereas 29.9% were unmarried. Therefore, an estimated 90% of rural respondents lead a married life. The above table data showed that (28.4%) of respondents replied about the occupations in which they were doing jobs at the time of the survey, whereas 28% were in agriculture, (26. 7%) were doing self-business, and (9.3%) were working as laborers. While (7.6%) of respondents replied they were doing poultry farming. Therefore, the results showed that (83.3%) of respondents replied their occupations were job, agriculture, and self-business. The above table data showed that 29.8% of respondents replied their main family income source was related to agriculture, 24% replied their income source belonged to business, and 23.1% replied their main source of income was to job, whereas 23.1% of respondents said that their main source of income was related to poultry farming. The results show that the majority of the respondents about their main family income source was agriculture. Whereas the proportion of respondents' main family income sources were job, business, and poultry farming.

Table–2: The respondents were categorized according to frequency and proportional percentage based on deforestation increases in your community (N=225)

Climate change decreases the local agricultural productivity	Frequency	Percent	
Strongly Agree	94	41.8	92.9
Agree	115	51.1	
Neutral	6	2.7	
Disagree	7	3.1	
Strongly Disagree	3	1.3	
Total	225	100.0	

Source: Field survey 2024

The agricultural output of Pakistan is predicted to expand in 2050 as food shortage and malnourishment reduce, climate change presents the most important risk to the food security of families who rely on smallholder farming on behalf of sustenance and livelihoods. Rising temperatures and irregular precipitation will threaten the construction of commodities via more severe drought, heat stress, and flooding situations. Small farmers’ families in environment-

susceptible regions are expected to experience an inconsistent amount of the harmful consequences of climate change (Ali et al., 2021). The descriptive table data depicted that 51.1% of the research participants strongly agreed and 41.8% of the research participants agreed with the statement “climate change decreases the local agricultural productivity”. While 2.7% of the research participants were "Neutral" and responded about the table statement. Moreover, 3.1% of the research participants disagreed and 1.3% strongly disagreed with the statement “climate change decreases the local agricultural productivity”. The results showed that a huge majority (92.9%) of the research participants agreed and strongly agreed that “climate change decreases the local agricultural productivity”.

Table –3: In the table below, the respondents were categorized according to frequency and proportional percentage based on climate change has effect on the overall economic sustainability of the local community

Climate change has effect on the overall economic sustainability of the local community	Frequency	Percent	
Strongly Agree	160	71.1	95.5
Agree	55	24.4	
Neutral	4	1.8	
Disagree	6	2.7	
Total	225	100.0	

Source: Field survey 2024

Climate change will lead to Sub-Saharan Africa US\$26 million in lost economic production by 2060. Another concern that is projected for Africa is the growth in drought and floods. Nations' development may be impeded by climate change. Climate change is anticipated to bring major economic harm to African nations, despite their efforts to limit the negative repercussions through adaptation and mitigation measures (Gemeda and Sima, 2015). The descriptive table data depicted that 71.1% of the research participants strongly agreed and 24.4% of the research participants agreed with the statement "climate change has effect on the overall economic sustainability of the local community". While 1.8% of the research participants were "Neutral" responded to the table statement. Moreover, 2.7% of the research participants disagreed with the statement "Climate change has effect on the overall economic sustainability of the local community". The results showed that a huge majority (95.5%) of the research participants agreed and strongly agreed that "climate change has effect on the overall economic sustainability of the local community".

Table-4: The association between more will be climate change and less will be agricultural productivity

At what extent do you agree that climate change is happening in your community	At what extent do you agree that climate change decreases the local agricultural productivity					Total
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	
To great extent	82	101	2	7	3	195
To some extent	10	14	4	0	0	28
Not at all	2	0	0	0	0	2
Total	94	115	6	7	3	225

Chi-square Value= 20.656^a

Degree of Freedom= 8

Level of Significance= 0.008

Highly Significant

Gamma Value= 0.80

In this table, the Pearson Chi-square = (20.656^a) which in turn has a probability value of = (0.000) which is less than (0.05), meaning that the variables were revealed to have a statistically highly significant relationship in this study. The Gamma value (0.80) reveals that there is a positive significant correlation between the variables. P-value = (0.000) shows the existence of a highly significant relationship between “more will be climate change and less will be agricultural productivity”. The agricultural output of Pakistan is predicted to expand in 2050 as food shortage and malnourishment reduce, climate change presents the most important risk to the food security of families who rely on smallholder farming on behalf of sustenance and livelihoods. Rising temperatures and irregular precipitation will threaten the construction of commodities via more severe drought, heat stress, and flooding situations. Small farmers’ families in environment-susceptible regions are expected to experience an inconsistent amount of the harmful consequences of climate change (Ali *et al.*, 2021). According to the quantitative figures obtained by the researcher to support the hypothesis it can be stated that more will be climate change and less will be agricultural productivity”. Therefore, taking into account the obtained results, it shall be noted that, the specified hypothesis with the title "more will be climate change; less will be agricultural productivity” is statistically deemed acceptable.

Table –5: The association between climate change and less will be economic sustainability

At what extent do you agree that climate change is happening in your community	At what extent do you agree that climate change has effects on the overall economic sustainability of the local community				Total
	Strongly agree	Agree	Neutral	Disagree	
To great extent	148	41	2	4	195
To some extent	11	14	1	2	28
Not at all	1	0	1	0	2
Total	160	55	4	6	225

Chi-square Value= 43.366^a

Degree of Freedom= 6

Level of Significance= 0.000

Highly Significant

Gamma Value= 0.618

In this table, the Pearson Chi-square = (43.366^a) which in turn has a probability value of = (0.000) which is less than (0.05), meaning that the variables were revealed to have a statistically highly significant relationship in this study. The Gamma value (0.618) reveals that there is a positive significant correlation between the variables. P-value = (0.000) shows the existence of a highly significant relationship between “more will be climate change and less will be economic sustainability”. Climate change will lead to Sub-Saharan Africa US\$26 million in lost economic production by 2060. Another concern that is projected for Africa is the growth in drought and floods. Nations' development may be impeded by climate change. Climate change is anticipated to bring major economic harm to African nations, despite their efforts to limit the negative repercussions through adaptation and mitigation measures (Gemedu and Sima, 2015). According to the quantitative figures obtained by the researcher to support the hypothesis it can be stated that more will be climate change and less will be economic sustainability. Therefore, taking into account the obtained results, it shall be noted that, the specified hypothesis with the title "more will be climate change; less will be economic sustainability" is statistically deemed acceptable.

Summary and Conclusion

Climate change is an alarming rate of growth in greenhouse gases in the environment as an outcome of numerous anthropogenic activities produces extreme weather and flooding, low agricultural productivity (both crops and cattle), biodiversity loss, risk of water stress, and a proliferation of various illnesses. Over the next century, it is anticipated that the temperature on the African continent will climb by 2 to 6C. Pakistan is among the top ten climate change-vulnerable nations and climate change constitutes a severe and rising risk to Pakistan, a nation

already coping with numerous social, economic, and environmental issues. Pakistan is seeing a distinct pattern of climate-related consequences, including more frequent and severe heatwaves, irregular monsoon patterns leading to destructive floods and droughts, and the increased melting of the country's key Himalayan glaciers. These shifts have serious ramifications for Pakistan's agriculture, water resources, and energy security, which are intricately interwoven with the economy and lives of its primarily agricultural people. This research is about exploring the effects of deforestation and climate change on communities' living and structure, A Sociological study in the Indus Riverine areas of Dera Ghazi Khan. The objectives of the study were to “explore the effects of deforestation and climate change on communities' living and structure” and to find out the views of people about the importance of forest significance in the prevention of climate change, reducing risk to the ecosystem, and biodiversity. The study also finds out the consequences of climate change such as agricultural productivity, extreme weather situations, droughts, floods, rainfall, and human health that are affected by climate change. Providing alternate sources of livelihoods, control of corruption, awareness campaigns, and reforestation can decrease the deforestation rate. It was concluded that more will be deforestation vs. more will be climate change; more will be the negative impact on the local ecosystem; and more will be air pollution in your community. So, all the hypothesis results are accepted.

Suggestions

Awareness Creation

The creation of awareness to the people could reduce the activity of deforestation. The rural people did not know the value of the existence of forests or the demerits associated with the act of deforestation. Hence, the kind of awareness regarding the usefulness of forests and the demerits of using axes on trees is crying for attention. Observation can be defined as a serious factor of awareness (Alarima 2011). Seminars by the administration regarding the subject as well as extension services should be offered to reach out to the rural folks and thereby help remedy the allied issues of deforestation.

Minimize fossil fuel use

Global warming is caused by the burning of fossil fuels which contributes approximately 75% of gases to the atmosphere. To reduce your consumption, you may: Capture and tap into renewable energy forms such as solar electric power. It continues with changing your gas stove to an induction stove. Replace your gas fireplace with an electric one. Utilize LED light bulbs

Minimize your carbon impact

There are many ways one can reduce carbon emissions, for instance planting a tree. Recycling, reusing, carpooling, taking public transit, and riding a bike

Improve your home

There are some ways that you may utilize to improve the electrical power efficiency of your home and these include installation of an accessible to programming or smart thermostat. Sealing of doors, and windows that were not well sealed, upgrading your insulation, and winterizing your house.

Eat less meat and dairy

You can also cut your carbon footprint by decreasing the amount of meat and dairy product consumption. You may try a plant-based diet or reducing beef and animal products on the frequency that you consume them.

Protect the environment

You may help safeguard the environment by preserving large forests such as the Amazon. The first measure to protect the environment is to protect large forests such as the Amazon area. Protecting the seas and reducing plastic

References

1. Abas, N., A. Kalair, N. Khan and A. R. Kalair. 2017. Review of GHG emissions in Pakistan compared to SAARC countries. *Renewable and Sustainable Energy Reviews*; 80: 990-1016.
2. Abid, M., J. Schilling, J. Scheffran and F. Zulfiqar. 2016. Climate change vulnerability, adaptation and risk perceptions at farm level in Punjab. Pakistan. *Science of the Total Environment*; 547: 447-460.
3. Ahmad, M. J., M. A. Iqbal, and K. S. Choi. 2020. Climate-driven constraints in sustaining future wheat yield and water productivity. *Agricultural Water Management*; 231: 105991-105995.
4. Alarima, C.I. 2011. "Knowledge and perception of genetically modified foods among agricultural scientists in south-west Nigeria". *OIDA International Journal of Sustainable Development*; 2 (6): 77-88.
5. Ali, S., H. I. Eum, J. Cho, L. Dan, F. Khan. K. Dairaku and S. Fahad. 2019. Assessment of climate extremes in future projections downscaled by multiple statistical downscaling methods over Pakistan. *Atmospheric Research*; 222 114-133.
6. Ali, U., W. Jing, J. Zhu, Z. Omarkhanova, S. Fahad, Z. Nurgazina and Z. A. Khan. 2021. Climate change impacts on agriculture sector: A case study of Pakistan. *Ciência Rural*; 51: e20200110; <https://doi.org/10.1590/0103-8478cr20200110>.
7. Asghar, M. M., Arshad, Z., Yousaf, S., e Ali, M. S., & Tariq, M. (2024). Environmental Degradation in BRI Countries: Navigating the Role of Natural Resources, Green Energy and Green Finance. *Pakistan Journal of Humanities and Social Sciences*, 12(3), 2705-2716.
8. Cramer, W., J. Guiot, M. Fader, J. Garrabou, J. P. Gattuso, A. Iglesias and E. Xoplaki. 2018. Climate change and interconnected risks to sustainable development in the Mediterranean. *Nature Climate Change*; 8(11): 972-980.
9. Gameda, D. O. and A. D. Sima. 2015. The impacts of climate change on African continent and the way forward. *Journal of Ecology and the Natural Environment*; 7(10): 256-262.

10. Ghani, M. W., M. Arshad, A. Shabbir, N. Mehmood and I. Ahmad. 2013. Investigation of potential water harvesting sites at Potohar using modeling approach. *Pakistan Journal of Agricultural Sciences*; 50(4): 209-218.
11. Glibert, P. M., J. Icarus Allen, Y. Artioli, A. Beusen, L. Bouwman, J. Harle and J. Holt. 2014. Vulnerability of coastal ecosystems to changes in harmful algal bloom distribution in response to climate change: projections based on model analysis. *Global Change Biology*; 20(12): 3845-3858.
12. Huang, Y., Rahman, S. U., Meo, M. S., Ali, M. S. E., & Khan, S. (2024). Revisiting the environmental Kuznets curve: assessing the impact of climate policy uncertainty in the Belt and Road Initiative. *Environmental Science and Pollution Research*, 31(7), 10579-10593.
13. Hussain, M., A. R. Butt, F. Uzma, R. Ahmed, S. Irshad, A. Rehman and B. Yousaf. 2020. A comprehensive review of climate change impacts. Adaptation, and mitigation on environmental and natural calamities in Pakistan. *Environmental Monitoring and Assessment*; 192: 1-20.
14. Iram, M., Zameer, S., & Asghar, M. M. (2024). Financial Development, ICT Use, Renewable Energy Consumption and Foreign Direct Investment Impacts on Environmental Degradation in OIC Countries. *Pakistan Journal of Humanities and Social Sciences*, 12(2), 1303-1315.
15. Kabir, M. I., M. B. Rahman, W. Smith, M. A. F. Lusha, S. Azim and A. H. Milton. 2016. Knowledge and perception about climate change and human health: findings from a baseline survey among vulnerable communities in Bangladesh. *BMC Public Health*; 16: 1-10.
16. Nadeem, M. U., Z. Waheed, A. M. Ghaffar, M. M. Javaid, A. Hamza, Z. Ayub and A. Zeeshan. 2022. Application of HEC-HMS for flood forecasting in Hazara catchment Pakistan, south Asia. *International Journal of Hydrology*; 6(1): 7-12.
17. NASA, 2018. Climate change. [WWW document]. PD and R 2017. Ministry of Planning Development and Reform. Retrieved on 4 July from <https://www.pc.gov.pk/>
18. Ozcan, B., P. G. Tzeremes and N. G. Tzeremes. 2020. Energy consumption, economic growth and environmental degradation in OECD countries. *Economic Modelling*; 84: 203-213.
19. Perkins, K.M., N. Munguia, R. Moure-eraso, B. Delakowitz, B.F. Giannetti, G. Liu, M. Nurunnabi, M. Will and L. Velazquez. 2018. *International Perspectives on the Pedagogy of Climate Change*; 200: 1043–1052.
- SFahad, S. and J. Wang. 2020. Climate change vulnerability and its impacts in rural Pakistan: a review. *Environmental Science and Pollution Research*; 27: 1334-1338.
20. Shehzad, K., A. Zeraib and U. Zaman. 2022. Testing the N-shaped environmental Kuznets Curve in Algeria: An imperious role of natural resources and economic globalization. *Resources Policy*; 77: 102700.
21. Siddiqui, S. and K. Javid. 2018. Spatio-temporal analysis of aridity over Punjab Province. Pakistan using remote sensing techniques. *Int J Econ Environ Geol*, 9(2): 01-10.