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Climate Change in Pakistan: Assessing Risks, Adaptation and Mitigation Strategies

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ABSTRACT

The purpose of the study is to determine the perceived risks of climate change in Pakistan, the awareness and adaptation practices among the people, and to determine mitigation measures. The study also considers how effective government policies are and how willing people are to make lifestyle changes to deal with challenges that are based on climate. Quantitative research design was used with a structured questionnaire online. The findings show that awareness of climate change is very high, with 88.6 % of respondents being aware of the issue and 80 % of the respondents believing that the problem is severe or very severe. The highest risks were noted to be water scarcity (71.4 %), floods (62.9 %), and heatwaves (57.1 %). Other popular adaptation practices included tree plantation (42.9%), water conservation (37.1%) but renewable energy adoption was low (11.4%). Most (51.4%) people considered government policies to be ineffective, but 85.7% were ready to change their lifestyles to reduce climate change. The role of the government as the key player in solving climate problems was also highlighted by the respondents with NGOs and communities as secondary players.

Keywords: *Climate Change, Risks, Adaptation, Mitigation, Pakistan, Public Perceptions.*

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Introduction

Climate change has become one of the most topical issues of the twenty-first century, covering all parts of the world with an extensive range of environmental, social, and economic impacts. It is no longer seen as a far-off threat, but rather as an imminent reality that has the power to change ecosystems, weather patterns, and the lives of millions of people (Hussain et al., 2020).

The most vulnerable are developing countries, especially South Asian nations, because they are geographically vulnerable, depend on climate-dependent activities, like agriculture, and their institutional frameworks have minimal ability to react quickly. As one of the top ten countries with the most significant impact of climate change, Pakistan experiences a particular multidimensional problem that jeopardizes not only the environment but also its socioeconomic stability and trajectory of further, long-term development. Pakistan is also susceptible to climatic change due to a combination of natural and human-manmade factors (Khan et al., 2021). Its physical location subjects it to the worst weather conditions, both in terms of devastating floods and extended droughts as well as heat waves and erratic monsoon cycles (Aslam et al., 2018). Meanwhile, the risks are increased by high population growth, deforestation, inappropriate urban planning, and excessive dependence on fossil fuels. Agriculture continues to be a major source of income in the country, and it is directly affected by water, soil erosion, and increase in temperature. Food security is becoming a burning issue especially as the supply of water resources is dwindling and the agricultural output is reducing (Ullah et al., 2022). Likewise, the health sector is experiencing increasing pressures, with climate change being a factor in waterborne disease transmission, respiratory infections and heat deaths. The high level of urbanization, underdeveloped government institutions, and lack of financial and technical capacity to adapt to climate makes these problems more severe (Fahad & Wang, 2018). The challenge from climate change in Pakistan is pressing. The ruinous floods 2010 and 2022 are notable examples of the human and economic impact of climate-induced disasters, which have resulted in the displacement of millions of people and caused billions of dollars in damages. Furthermore, the findings of persistent droughts and heat waves over the long term for Sindh and Balochistan are used to illustrate the complex nature of climate risks in the country. Ancestors are responsible for breaking up the infrastructure, enhancing the poverty cycle, social injustice, and migrations. Low accessibility to resources and adaptive capacity is a problem for rural poor, women and marginalized communities that are already affected by these impacts (Khan et al., 2020). Climate change management in Pakistan, therefore, must be holistic and integrated in order to encompass the risk assessment, adaptation, and mitigation plans and to promote community and institutional coordination (Ahmed et al., 2020).

The social consideration and opinion of the masses is the key to climate change reactions. It is important to understand how communities perceive risks, the strategies they have implemented in order to cope with the risks and their readiness to engage in mitigation efforts, when formulating effective policies. In most scenarios, awareness affects behavior change and defines whether individuals and communities take proactive or reactive actions (Ali & Erenstein, 2017). As Pakistan has formulated national policies and plans, like the National Climate Change Policy and the National Adaptation Plan, their performance is mostly based on public involvement, implementation at more local levels, and adhering to the realities at the ground level. There is thus a need to analyze not just the level of awareness of the citizens but also the perceived policy implementation lapses and the possibility of community-based solutions (Mumtaz, 2018). Pakistan has a long history of adaptation strategies based on coping up measures such as tree plantation, water conservation, and migration from highly vulnerable regions. Although such undertakings are worth doing, their implementation is usually short-lived and unsustainable. As an example, highly marketed tree plantation drives are not always supported by appropriate maintenance and supervision (Ali, 2018). Likewise, the adoption of water-saving habits is not proportional in communities based on education, access to technology and culture. Substantial investments are needed for mitigation measures such as the adoption of renewable energies, waste management and afforestation

(Abbass et al., 2022). The high fossil energy consumption levels and abnormal energy use trends in Pakistan also prove the urgent need for the transition towards sustainable energy systems.

But limitations in funding, lack of inspiration and awareness retard progress in this field. Government institutions are a critical part of the solution to climate change but people don't trust the policy. Citizens feel that there is a disconnect between the high profile policy statements and practice (Elahi et al., 2022). The lack of proper systems, overlapping duties, insufficient resources, or a combination of all three commonly leads to lack of organizational focus. Ignoring ineffectiveness of any kind causes a general disillusionment among the population, and a complete abdication of responsibility toward climate change. Building climate resilience requires active and good climate governance. Therefore, investing more money into good governance and climate resilience will yield more, both in funds saved and climate results achieved (Ali, 2017). In the meantime, technical knowhow, financial support and creative solutions can be achieved through cooperation with non-governmental organizations, international agencies, and communities.

Cooperative solutions that combine government intervention with grassroots should be expected to produce more sustainable results. Mitigation and adaptation should not be viewed as two separate issues as they should be simultaneously followed to manage both the existing weaknesses and the risks in the future (Syed et al., 2022). Whereas adaptation limits the direct exposure to climate risks, mitigation deals with the factors that cause climate change by minimizing greenhouse gases. In the case of such a country as Pakistan, it is especially difficult but still mandatory to strike a balance between these two strategies. On the one hand, the nation has had to change quickly to ensure lives and livelihoods are not disrupted by frequent disasters (Mahmood et al., 2021). On the other hand, it needs to put investments into mitigation to reduce its carbon footprint and to align with international climate pledges.

The willingness of the citizens to alter their way of living and the current study points to the fact that citizens are ready to support mitigation as long as the enabling conditions are there (Rana et al., 2020). Finally, in Pakistan, climate change is not only an environmental problem, but it is also a complex problem which intersects with economic development, public health, food security and social equity.

An understanding what people see and do helps to bridge the gap between theory and practice. This research will assist to inform the policy makers, researchers and practitioners the importance of responding to risks in a systematic manner through the analysis of risks, adaptation and mitigation (Rana & Routray, 2018).

To strengthen Pakistan's resilience, appreciation for science will need to converge with rudimentary practices, institutional silos will need to be strengthened, and a culture of shared responsibility encouraged. Overcoming the complex challenges posed by climate change will require concerted action, and will mark a milestone as the country strides towards a sustainable and climate resilient future.

Literature Review

Global Perspective on Climate Change

Climate change has become one of the most popular and talked about issues in the world. Researchers point to its international character, the effects of which are manifested in environmental, economic, and social contexts. Increasing temperatures, melting glaciers, rising sea levels, changing weather patterns have been reported in virtually all corners of the earth. The Intergovernmental Panel on Climate Change (IPCC) has continuously pointed out that deforestation, industrialization, burning of fossil fuels, and other human activities are the biggest contributors of greenhouse gas emissions (Pachauri & Chand, 2008). Although the most significant contributions to the emissions are made by the industrialized countries, the developing countries experience a disproportionate impact because of their insufficient adaptive capacities. The international literature highlights the need to adopt both adaptation and mitigation measures so as to create resilience in the long run.

Climate Change in South Asia

South Asia is considered one of the most susceptible areas to climate change because of its geographical position, the great number of people,

and the fact that the country heavily relies on climate-dependent industries like agriculture (Sivakumar & Stefanski, 2010). In this part of the world, the countries experience frequent floods, cyclones, droughts, and heatwaves, which impact millions of people every year. The Himalayas, sometimes referred to as the water tower of Asia is facing a rapid melting of its glaciers which endangers the population down the river. South Asian agricultural systems are under strain and changing rainfall patterns and extreme events cause food insecurity (Turner & Annamalai, 2012). Other socio-economic aspects of climate change such as poverty, migration, and health risks are also highlighted in the literature in South Asia, worsening already existing inequalities.

Climate Change in Pakistan

Pakistan has always been rated as one of the most affected nations by climate change. According to literature, the nation is exposed to numerous risks including glacial melting in the north, frequent floods in Punjab and Sindh, extended droughts in Balochistan and excessive heatwave in cities (Farooqi et al., 2005). Agriculture - a sector that has a large workforce and makes a big contribution to GDP - is especially susceptible to increased temperatures and water shortages. Studies also indicate the health effects of climate change in Pakistan, such as the transmission of diseases by vectors, malnutrition caused by reduced crop production, and heat diseases (Yousaf ett al., 2025). There is also the issue of rapid urbanization, poor infrastructure, and governance that increases the risks (Nasir et al., 2025). In the literature, it is continuously emphasized that the exposure of Pakistan to environmental risks is only one factor that contributes to the vulnerability of the country but also institutional and socio-economic limitations.

Perceptions and Awareness of Climate Change

Research in various nations indicates that social perception of climate change is an important determinant of adaptation and mitigation. Climate change awareness affects behavioral decision, community active interest and endorsement of government policy (Yi et al., 2025). In Pakistan, and in most developing nations, there is an increase in awareness because of the growing media attention, awareness programs, and the obvious consequences of climate-related disasters. But there is still a lot of room between awareness translation to long-term behavior change (Abid et al., 2015). Other studies also present discrepancies in the level of awareness according to education and occupation and geographical location (Knight, 2016). Examples of this include rural communities being more directly impacted by climate effects but with lower levels of scientific education, or urban populations with higher levels of scientific education but lower levels of direct coping strategies.

Risks Associated with Climate Change

The literature mentions a rather wide scope of risks linked to climate change, especially in the vulnerable countries. Water shortage becomes a focal point, and decreasing river flow, ineffective irrigation, and groundwater overuse become long term issues. Another major risk, the most researched and known, is flooding, which is typically linked to a glacial lake outburst and unpredictable monsoon rains (Khan et al., 2016). Water scarcity and heatwaves are rapidly increasing and have devastating consequences for human health and agriculture. Impairment in food security and livelihood is a serious concern, especially for low-income earners who lack adaptive capacity (Mahmood et al., 2016). Experts think that such risk is interdependent and that the occurrence of one event can trigger a chain of events in different industries.

Adaptation Strategies

In the majority of the literature, adaptation has been referred to as an important climate change response, especially in relation to those nations that are less responsible for global emissions but bear significant burdens (Saddique et al., 2022). Adaptation strategies such as afforestation, water conserving measures, climate-resilient agriculture and disaster preparedness are all carried out in Pakistan. Studies emphasise the importance of community-based adaptation, where local knowledge and practices are being integrated on to broader scales. But efficient adaptation is often hindered by problems such as lack of resources, ignorance, and ineffective coordination of institutions (Muzammil et al., 2023). Another observation in the literature regarding adaptation efforts is that these tend to be short-term and reactive, rather than long-term and proactive.An

example is that post-disaster response is commonly given priority over pre-disaster preparedness, which exposes communities to multiple shocks (Usman et al., 2023).

Mitigation Efforts

Mitigation is the response that focuses on the factors that cause climate change by lessening greenhouse gas emissions. Mitigation measures being implemented across the world are switching to renewable energy, energy efficiency, and deforestation reduction. Mitigation has not been given as much attention as adaptation in the case of Pakistan simply because of the economic aspects and the fact that the contribution of the country to global emissions is very low (Malhi et al., 2021). Nevertheless, the literature underlines that mitigation remains significant to ensure that Pakistan is able to keep up international commitments in order to transition to sustainable development. Solar and wind energy are renewable resources that have great potential and are not yet fully exploited because of low financial and technical costs. Potential mitigation also includes waste management, improvements in public transportation, and education.

Role of Government and Institutions

Climate change literature often talks about the role of government policy and institutional frameworks. It is viewed that good governance is the key to integrating climate concerns into national development planning (Masud & Khan, 2024). In Pakistan, The National Climate Change Policy along with its provincial action plans have made some progress, however, the issue of implementation continues to linger. Enforcement gaps, overlapping responsibilities, and a lack of inter-agency coordination often sabotage the work (Shah et al, 2019). It has been proposed in the literature that effectiveness might be enhanced through decentralization and community level engagement. Furthermore, working in partnership with NGos and international bodies is essential to provide the requisite technical know-how, funding, and innovative ideas. Transparent governance and accountability is a recurring concept since it aims to gain public trust and ensure success in climate actions.

Community Participation and Lifestyle Changes

(Iqbal, 2020) highlights the issue with the new trend in participating community with individual lifestyle changes in order to mitigate the changes happening to the climate. (Sohail et al., 2022) argue that while "Big policies and infrastructure spending are significant," small changes like turning off the lights, reducing the use of disposable plastic, and other lifestyle changes can achieve the bigger targets. It has been shown that processes of adaptation and mitigation are more successfully sustained when community members are actively involved. Grassroot movements and youth mobilization are emerging in Pakistan, but more has to be done mechanism-wise to scale up. Individual willingness to change one's lifestyle is laudable, but policies must be put in place to facilitate the change.

Problem Statement

Pakistan is one of the most vulnerable nations to climate change, as it is regularly affected by floods, droughts, heatwaves and glacial melting that are impacting agriculture, water, health and livelihoods. Despite growing recognition, adaptation and mitigation measures are not well integrated, are underfunded and underperformed. The risks are increased by weak governance, poor institutional capacity, and poor public participation. This awareness-action divide shows that there is an urgent need to measure the magnitude of climate change effects in Pakistan, and to measure what is done to improve adaptation and mitigation to make it resilient and sustainable.

Objectives of the Study

- To determine the awareness, and perception of climatic change between the various groups in Pakistan.
- To determine the significant risks and vulnerabilities posed by the phenomenon of climate change in the country.
- To analyse some of the current adaptation strategies implemented at community and institutional levels.
- To measure mitigation efforts and how well government policies are doing to address climate change issues.

Research Methodology

This paper used a quantitative research design to examine perceptions of the public, risks, adaptation, and mitigation strategies in response to climate change in Pakistan. In order to achieve high accessibility and participation by various population groups, a structured questionnaire was designed and distributed online. The instrument consisted of close-ended questions about climate change knowledge, personal perceptions of the causes and intensity, effects experienced, adaptation behavior, preference of mitigation, and perception of government policies.

The sample size was 350 respondents, chosen using convenience sampling, and represented a varied mix of age groups, education levels and professional backgrounds. This heterogeneity helped to capture several perspectives on climate change while maintaining representativeness of the sample of students and professionals in the study. Demographic information such as age, gender, education and occupation were gathered to evaluate trends across categories.

Data were analyzed descriptively using frequencies and percentages providing explicit information regarding awareness levels, risk perceptions, adaptation strategies and preferred mitigation measures among the population. The utilization of easy-to-understand statistical tools made results easy to understand, interpret, and directly related to the study objectives. Tables and figures were used to clarify ideas and reinforce major trends.

The methodology was structured to achieve reliability and validity of findings through the use of a systematic and consistent approach to data collection and analysis. While the study provides useful insights into climate change perceptions in Pakistan, it also recognizes the limitations of convenience sampling and reliance on self-reported data, which can introduce bias. Despite these limitations, the selected approach was adequate for investigating the awareness-action gap and to produce evidence-based implications for policy and practice.

Results & Discussions

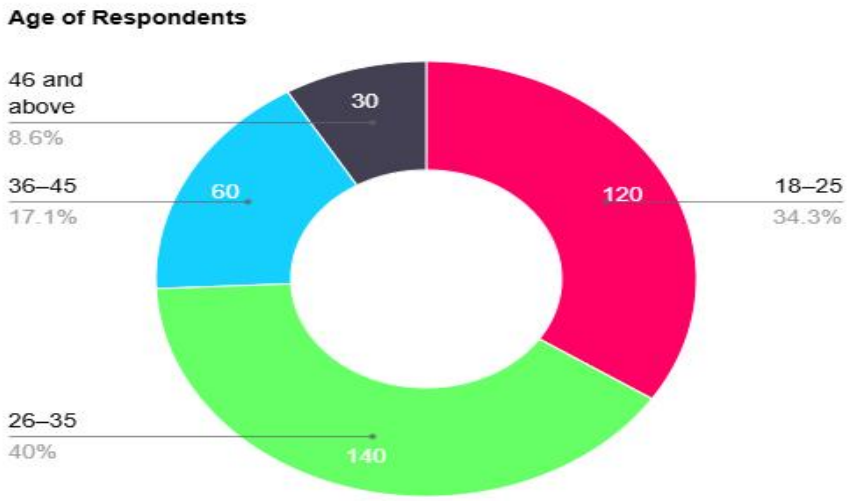

Figure 1: *Age of the Respondents*

The age distribution of the respondents shows that most of them were in the younger and middle age category. To be more precise, the highest percentage was 40 of the 2635 age group and the next percentage was 34.3 of the 1825 age group. It demonstrates that the sample was predominantly represented by youth and early-career professionals, as almost three-fourths of respondents were younger than 35. The 36 45 age group constituted 17.1 and the 46 and above age group constituted 8.6. In general, the statistics indicate that the research is mainly based on the opinions of younger participants, and relatively fewer age groups have contributed to it.

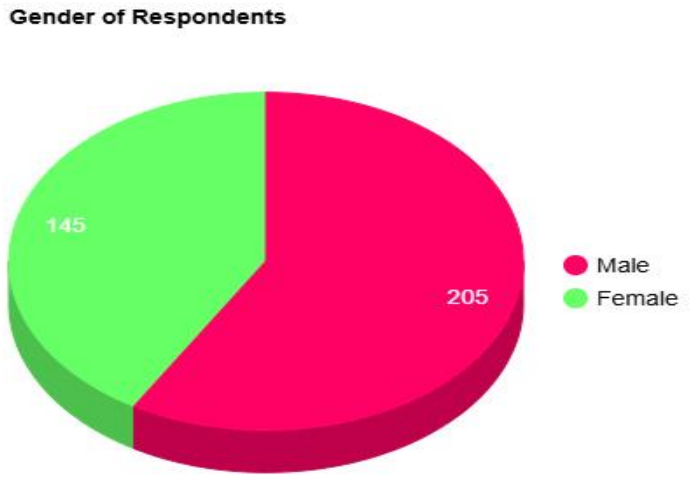

Figure 2: *Gender of the Respondents*

Respondents gender distribution indicates that more males were in the sample, making 58.6 per cent, than females who constituted 41.4 per cent. Although the ratio between both genders was equal, the male respondents dominated. This means that there is a possibility that the results represent a bit of a stronger male point of view, but the high numbers of female inclusion alleviate this concern.

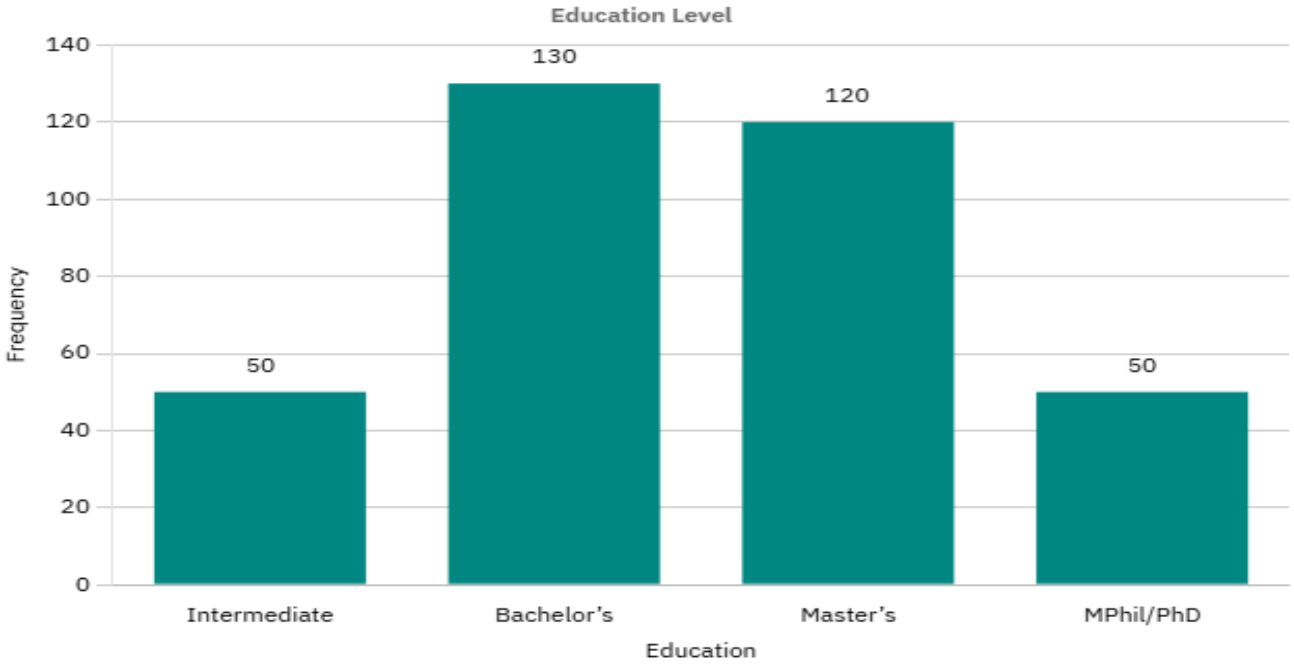

Figure 3: *Education Level of the Respondents*

The respondents have an evenly distributed representation in the educational profile with regard to the qualification levels. Those with a bachelor degree were the largest (37.1%), with master's degree holders coming close after that (34.3). The representation of respondents with intermediate education and MPhil/PhD qualification was 14.3 each. This distribution shows that most people included in this sample were fairly well educated, over 70% of the sample had at least a bachelor or a master's degree, which gives the study information mainly of academically qualified respondents.

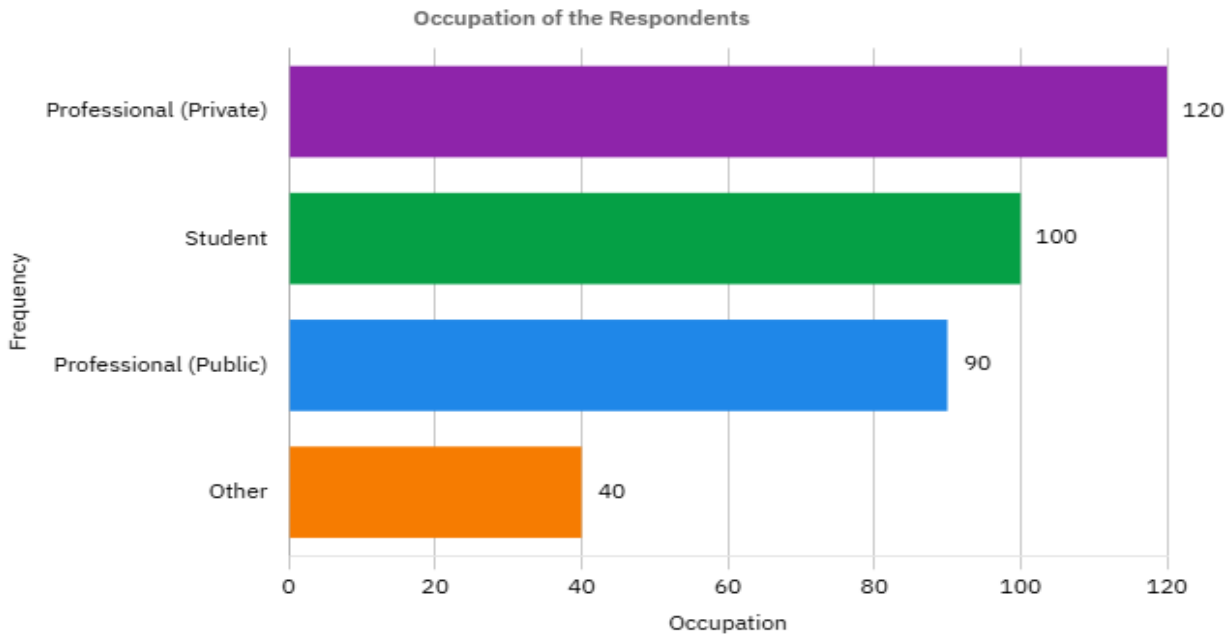

Figure 4: *Occupation of the Respondents*

The distribution of occupations among respondents reflects the wide variety of fields of the respondents. Private sector professionals made up the largest segment of the group at 34.3%, followed by students at 28.6% and public sector professionals at 25.7%. Smaller numbers, 11.4% were in the "other" category, meaning men whose occupations were not classified in this way. Overall, the sample tends to be balanced in terms of students vs. professionals, with a bit more representation from the private sector to provide perspectives from both academic and professional experiences.

Table 1: *Awareness of Climate Change*

Response	Frequency	Percentage (%)
Yes	310	88.6%
No	40	11.4%
Total	**350**	**100%**

The results show that respondents are very aware of climate change, with 88.6% of respondents being familiar with the issue. Overall, the percentage that had not heard of it was fairly small at just 11.4%. This shows that climate change is a concern among the sample population and highlights a strong general awareness of the issue that can form a basis for further education, policy action, and participatory processes within communities.

Table 2: *Main Cause of Climate Change*

Response	Frequency	Percentage (%)
Human activities	200	57.1%
Natural causes	40	11.4%
Both	90	25.7%
Not sure	20	5.8%
Total	**350**	**100%**

In terms of the causes of climate change, the results show that most of the respondents (57.1%) chose human activities as the most important factor causing climate change, revealing a high degree of awareness among them regarding anthropogenic factors contributing to environmental issues. One fourth of the participants (25.7%) believed that climate change is caused by both natural and human activity, which could be considered a more balanced view. Meanwhile, a small minority (5.8%) were undecided, and a much larger minority (11.4%) saw natural causes as the only factor. In sum, the results point to a clear awareness of human responsibility, although some respondents still allow for natural factors or make statements showing feelings of uncertainty.

Table 3: *Severity of Climate Change in Pakistan*

Response	Frequency	Percentage (%)
Very Severe	180	51.4%
Severe	100	28.6%
Moderate	50	14.3%
Not Severe	20	5.7%
Total	**350**	**100%**

The results revealed that among the Pakistani respondents the perception of severity of climate change is high. Over 50% (51.4%) reported it to be "very severe" and 28.6% were "severe", which together make up more than 80% of the sample. The numbers were: 59.7% saw the issue as "severe"; 14.3% as "moderate"; and just 5.7% as "not severe." These results highlight a strong agreement that climate change is a critical and urgent threat for Pakistan, in line with heightened public concern about impacts.

Table 4: *Experienced Impacts of Climate Change*

Response	Frequency	Percentage (%)
Yes, frequently	100	28.6%
Yes, sometimes	160	45.7%
Rarely	70	20.0%
Never	20	5.7%
Total	**350**	**100%**

The data shows that most respondents have in one way or another felt the effects of climate change. Nearly half of the respondents (45.7%) reported such impacts “sometimes,” and 28.6% reported frequent exposure to such impacts. Further, 20% reported being affected very infrequently and only 5.7% reported never having been affected. Given that, the results collectively indicate that the consequences of climate change are widely distributed across the population, supporting its salience as a pressing national issue.

Table 5: *Risks of Climate Change (Multiple Response)*

Risk Factor	Frequency	Percentage (%)
Floods	220	62.9%
Heatwaves	200	57.1%
Water Scarcity	250	71.4%
Agricultural Loss	180	51.4%
Health Issues	160	45.7%

The responses show a wide range of perceived climate change-related risks, with water scarcity being the biggest of these, mentioned by 71.4% of the respondents. Flooding (62.9%) and heatwaves (57.1%) were also seen as significant threats, which is consistent with knowledge that Pakistan is vulnerable to extreme weather events. Agricultural losses were the second most significant threat identified, with 51.4% of respondents defining this as the loss of food security, and 45.7% citing health as an impact. These results indicate that respondents see climate change as a complex problem, with significant implications for resources, livelihoods and public health.

Table 6: *Adaptation Measures Taken*

Strategy	Frequency	Percentage (%)
Water-saving methods	130	37.1%
Planting trees	150	42.9%
Renewable energy use	40	11.4%
Relocating/migration	20	5.7%
No measures taken	10	2.9%

The results indicate that adaptation measures implemented by the respondents to cope with climate change have a very wide range, with tree plantation (42.9%) and water-saving measures (37.1%) being the most popular strategies. A lower proportion reported taking a renewable energy-based coping mechanism (11.4%) or relocation/migration as coping (5.7%). Importantly, the number of individuals taking no measures whatsoever was very low (2.9%). The results indicate that a large majority are already practicing environmentally responsible practices and that these are, in the main, based on nature-based and optimising resource consumption practices.

Table 7: *Effectiveness of Government Policies*

Response	Frequency	Percentage (%)
Very Effective	30	8.6%
Somewhat Effective	90	25.7%
Not Effective	180	51.4%
Don’t Know	50	14.3%
Total	**350**	**100%**

The perception of government policies on climate change appears largely unfavorable among respondents. More than half (51.4%) considered the policies "not effective," while 25.7% viewed them as "somewhat effective." Only a small proportion (8.6%) rated the policies as "very effective," and 14.3% were uncertain. These results indicate a significant gap between policy efforts and public expectations, highlighting the need for stronger, more visible, and impactful government actions to address climate change challenges in Pakistan.

Table 8: *Preferred Mitigation Strategies*

Strategy	Frequency	Percentage (%)
Renewable energy	140	40.0%
Waste management	70	20.0%
Afforestation	90	25.7%
Reducing fossil fuels	30	8.6%
Awareness campaigns	20	5.7%

Results show that renewable energy sources is the most favored mitigation strategy, with 40% of respondents choosing this option, reflecting an increasing awareness of the role renewable energy can play in mitigating emissions and achieving sustainability. Afforestation was also considered an important action by 25.7%, while 20% were in favor of waste management as a key action. Other options - reducing fossil fuel (8.6%) and awareness campaigns (5.7%) - were selected less often, reflecting respondents' belief that while these are important, they are less important than large-scale structural solutions such as clean energy and tree plantation than individual or awareness-based actions.

Table 9: *Willingness to Change Lifestyle*

Response	Frequency	Percentage (%)
Yes, definitely	200	57.1%
Yes, to some extent	100	28.6%
No	30	8.6%
Not sure	20	5.7%
Total	**350**	**100%**

The results show that there is a high willingness among respondents to adopt lifestyle changes in response to climate change. Most (57.1%) were definitely ready and 28.6% were willing to make some changes. Only 8.6% were not willing to change and 5.7% were still undecided. Overall, the research findings reveal a positive public opinion of behavioral change, and great potential exists for community-based behavioral adaptation strategies to be used alongside wider climate mitigation initiatives.

Table 10: *Climate Change as a Threat to Pakistan's Future*

Response	Frequency	Percentage (%)
Strongly agree	190	54.3%
Agree	120	34.3%
Neutral	25	7.1%
Disagree	15	4.3%

Total	**350**	**100%**

Climate change is perceived by respondents as a threat to Pakistan's future in the overwhelming majority. More than half (54.3%) strongly agreed with the statement and another 34.3% agreed, for a cumulative agreement rate of almost 89%. A very small group of respondents were either neutral (7.1%) or disagreed (4.3%). These findings highlight a broad agreement among adults that climate change presents a serious long-term threat to the country, and reflects widespread concern about its future impact.

Table 11: *Who Should Take the Lead Role?*

Response	**Frequency**	**Percentage (%)**
Government	180	51.4%
NGOs/International Orgs	70	20.0%
Local Communities	50	14.3%
Individuals	50	14.3%
Total	**350**	**100%**

The responses show that the majority of respondents (51.4%) think the government should play the leading role in combating climate change, reflecting the expectations for high level of policy action at the national level. NGOs and international institutions were each selected by 20 per cent of respondents, with a further 14.3 per cent of respondents mentioning local communities and individuals, respectively. Overall, the findings indicate that although collective action is acknowledged to be important, there is a strong public perception that leadership by government is key to effective climate change mitigation and adaptation action.

Discussion

The research findings of this study show the increasing concern about climate change in Pakistan and the need for effective adaptation and mitigation measures. The results show a high level of awareness, with a majority of respondents recognizing climate change as a pressing issue. This is symptomatic of growing awareness of environmental issues, especially amongst educated and urban people. However, awareness is not enough to lead to effective action unless backed by institutional frameworks and good policy implementation.

Particularly noticeable is the level of perceived climate change severity among respondents. Results show that more than half of the participants (64%) perceived climate change in Pakistan to be very severe, followed by 28.6% who perceived climate change in Pakistan to be severe. This is in line with the vulnerability of Pakistan, which ranks as one of the most climate-affected countries in the world, to recurrent floods, extended heatwaves, and increasing water scarcity. The results also highlight that the main threats related to climate change are water scarcity, floods and heatwaves, reinforcing other recent national and international reports that flag water resources and agriculture as critical sectors at risk.

Individual and community level responses are reflected in adaptation strategies that respondents report. Most common practices were the planting of trees and water conservation practices. As important as these measures are, they might not have the scale and effects they are supposed to have without government facilitation (Ali et al., 2018). Interestingly, the respondents who mentioned that they moved to renewable energy or moved as an adaptation measure were in the minority, which suggests that financial limitations, unavailability, and low awareness among the population about technological options were the obstacles (Rana & Routray, 2018). Furthermore, most of the respondents rated government policies on adaptation as ineffective, implying that there is a disconnect between the policy frameworks and implementation at the

ground level. This discontent indicates the necessity of greater institutional capability, open governance, and greater investment in sustainable practice (Ullah et al., 2018).

In terms of mitigation options, renewable energy and afforestation were the preferred options by respondents. These results show a population preference for long-term and environmentally sustainable solutions (Ali et al., 2017). However, waste management and awareness campaigns were less supported, perhaps because of lack of exposure to these activities or lack of perceived impact at the community level. Importantly, respondents were willing to change their lifestyles (e.g. conserving energy, reducing plastic use), reflecting a growing sense of responsibility for personal action in response to climate change (Fahad & Wang, 2018).

Finally, perceptions of responsibility indicate that most respondents see the government as the most important actor to take climate action. While NGOs, communities and individuals were also named, their roles were placed as secondary. This means that citizens believe that the national authorities should have a leading role in climate governance, but that shared responsibility across sectors is needed.

On the whole, the research indicates a paradox, namely, awareness and concern about climate change is high, but the confidence in governmental action is low, and individual action remains small-scale. The only way to close this gap is through combined policy efficiency, citizen participation, and cross-border collaboration.

Conclusion and Recommendations

The paper has brought out the fact that climate change presents significant threats to the environment, economy and society of Pakistan. The results indicate that the extent to which people are aware of the impacts of climate change is quite high, but the impacts of climate change are still increasing (including water shortages, floods, droughts, and heat waves). Agriculture, livelihoods and health are the most susceptible and put additional strain on already fragile systems. Although these challenges have been identified, adaptation and mitigation measures are still weak, incomplete, and poorly implemented. There are institutional frailty and inadequate resources and policy implementation that do not support responsive efforts. Furthermore, the disconnect between awareness and action on the community level demonstrates that better coordination among individuals, governmental organizations, and international bodies is required. In general, it can be concluded that climate change in Pakistan is a socio-economic and governance problem that demands urgent, comprehensive, and sustained action as an environmental problem.

In order to overcome these challenges, a multi-level and integrated approach is required. There should also be more focus on strengthening governance and the implementation of policies as well as proper enforcement mechanisms, institutional coordination, and clear accountability. Local adaptation capacity can also be improved by decentralized governance. The key to mitigating these vulnerabilities is investment in infrastructure with climate resilience (e.g., dams, better irrigation, renewable energy sources, e.g., solar and wind energy, etc.). Training disaster preparedness, afforestation and rainwater harvesting: Grassroots campaigns should be encouraged at the community level to enhance resilience. Behavior change, induced by increasing the public understanding and knowledge through campaigns and curriculums can contribute to sustainable consumerism, as well as promote energy conservation. Also, Pakistan needs to enhance the global cooperation that will help it receive funding, transfer of technology, and expertise, as well as take an active role in meeting the global obligations.

Conflict of Interest

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