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Bridging Climate Awareness and Architecture: The Impact of Climate Change Perceptions on KPK's Architectural Practices

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***Abstract*:** Climate change is one of the biggest threats to humanity and a case in point is Pakistan which is very affected by that aspect as is ranked 5th in the most vulnerable country list where it is experiencing severe problems like habitat loss, food insecurity, flooding and irregular weather patterns. Khyber Pakhtunkhwa (KPK) province in North Western Pakistan has, in particular, suffered from some of these effects such as heat waves and floods, shelter & energy crisis and water stress to the region where there has already been plenty allied issues. The main objective of the study was to understand the views of the architecture professionals in KPK regarding climate change as well as targeting the means addressing the changes in their practice. The study conducted primary data collection through face-to-face interviews held in the cities of Abbottabad, Peshawar and Haripur and an online questionnaire collection, which included questions on demographics, attitudes towards climate changes and architectural measures taken. The results showed that 98 percent of the respondents had heard of climate change while 95 denounced it as a problem for the environment. Many respondents pointed out the burning of fossil fuels and non-renewable sources of energy as major causes. While recognizing the importance of the construction industry, it is discouraging that the construction industry is increasingly reluctant to adopt green building solutions including energy efficient strategies, even use of local materials and active and passive solar technologies.

Climate Change, KPK, Architectural Practices, Environmental Design.

1. Introduction

One of the greatest threat to the humankind today is regarded to be climate change and its severe negative impacts. People refer to such phenomena as climate changes when there are non-reversible changes in the normal weather patterns of an area over a long period of time (Carter et al., 2015). Climate change encompasses anthropogenic warming and the alteration of weather patterns on Earth. Repeated and long events of climate change have occurred before, but this one is unlike any other because this one is happening in record time (Rehan, 2016). The reason for this is the greenhouse gas emissions like carbon dioxide (CO_2) and methane (CH_4). Most of these emissions are as a result of burning fossil fuels in the energy sector. Other contributors include agriculture, steel production, cement making, and deforestation (Füssel, 2007). The increase in temperature is also influenced by climate feedbacks such as reduction in snow cover and drought areas which release carbon monoxide. When all these are put together, they contribute to the overall increase in warming of the atmosphere. Most of the global average temperature rise occurs

in land with the rate doubled (Malik et al., 2012). A rise in temperature also led to an expansion of deserts, as increased number of heat waves and wildfires became an everyday occurrence on global scale (Khan et al., 2016). The danger that climate change poses to peoples consists in scarcity of food and lack of clean water and severe abrupt floods, diseases, extreme temperatures, climate-related economic damages, and many other severe events. Some of these consequent even imparting human beings migrations. WHO regards climate change as the most severe threat and to the health of humans on the planet, in the 21st century (Bhatti et al., 2023).

It is well established that Pakistan is one of the most vulnerable countries in facing climate change and its impacts (Bhatti & Iftakhar, 2023). In terms of scale of adversity, the 5th ranking country Pakistan also encounters dangers of encroachment, adverse health effects, low supply of food, food and water shortage, irregular weather patterns, intermittent rain and the like many more critical and severe effects (Bhatti et al., 2024). The geography of the country along with the tropical continental climatic attributes (hot summers and cold winters) predispose it to the occurrence of several climate and weather related natural disasters. In Pakistan, seasonal heat and droughts alternate with severe riverine and flash floods, and sometimes with landslides and flooding over areas where in past there was scarcity of water (IFRC, 2021). Climate change is likely to improve its frequency and intensity of these events but also complicates the people's vulnerabilities even further more. It is expected that there will be notable warming across the nation especially in mountains of the north that are covered in snow and other mountainous areas having high rain frequency and thus causing more rapid ice and glacier melting that changes patterns and flows in the Indus river and others (Tubridy, 2020). Heat waves of ever long durations are forecasted to occur in all regions of Pakistan and so too will the number of 'hot' days and hot nights. These abrupt patterns will severely impact the lives of the people in KPK province (Osman & Sevinc, 2019).

Khyber Pakhtoon Khawa (KPK) is the North-Western highend areas province of Pakistan with diverse geographic elements all across its area. It has many large urban cities and centers and have been a major hub of education across the country. With recent climate change impacts including heat waves and floods over the last one decade, people have been facing the challenges of survival and shelter with major river lines, agricultural lands, earthquake prone zones and allied issues of electricity, energy and water shortages. Hence with the third largest province by population, people faced climate change across all mediums of life and scale (Mumtaz, 2021).

Built environment and Architecture have been a source of friend of mankind since human race history itself to give shelter, protection and barrier against natural threats of environmental exposures and animals. Yet with the modern day development and construction shifting to non-renewable resources lead to production of green house gases which contributed to global warming and later transformed into climate change. According to a recent research, 40% of the overall energy produced including energy from fossil fuels were used in either construction or operations of the buildings and built environment. As a result, it can be stated that Architecture, Engineering, Construction & Operation (AECO) industry has been on the opposite side of the equation against the nature and environment (Shah et al., 2023). Hence the role of the modern day designer in Pakistan is vital towards managing the burden of climate change for the future generations and optimizing the current built urban and rural builtscape.

Hence there lied a major issue at hand to evaluate the current perceptions of the architectural fraternity and professionals about the current challenge of climate change faced by the nation and how their design practices have so far evolved to make any changes or amendments in their design process, protocols and solutions to mitigate and resolve the current challenge at hand. Hence the research set forth the following three major research objectives as stated below:

1. To evaluate awareness and knowledge of climate change & its impacts amongst practicing architects in KPK province.
2. To identify their existing practices and how it has been impacted due to climate change.
3. To develop strategies facilitating the future line of actions for architects to better compete the climate change challenge.

Fighting back the climate change requires architects to be highly sensitized and aware about the impacts, phenomena's and future consequences prediction and mitigation. Without an effort to integrate strategies and policies to mitigate the climate change impacts through design solutions for better environmental performance, these impacts would only increase. Hence there was a need to evaluate the current awareness and knowledge of the practicing architects in KPK province and how they have been able to cope with the current challenge through their design interventions by adopting to climate change mitigation. The research has identified few current trends as well as gaps which can add better value addition in future for managing these challenges through architectural design integration.

2. Review of Literature

The average weather conditions over a long period in a given area is referred to as the climate. Climate change means any shift in the average of these mid-term phenomena which is long and mostly irreversible in nature (Khelil et al., 2019). Humans are the prime culprit in today's severe climate change by using coal, gas and oil in their homes, businesses and automobiles. The carbon dioxide produced by the processes of fossil fuel burning constitute the highest percentage of all greenhouse gases released during the combustion of fossil fuels. The ability of these gases to capture solar energy leads to an increase in the temperature of the earth's surface. The impact of climate change has made the average temperature of the earth today 1.2 degree Celcius higher than the usual temperatures recorded in the 19th century due to the increase in levels of CO2 by 50%.

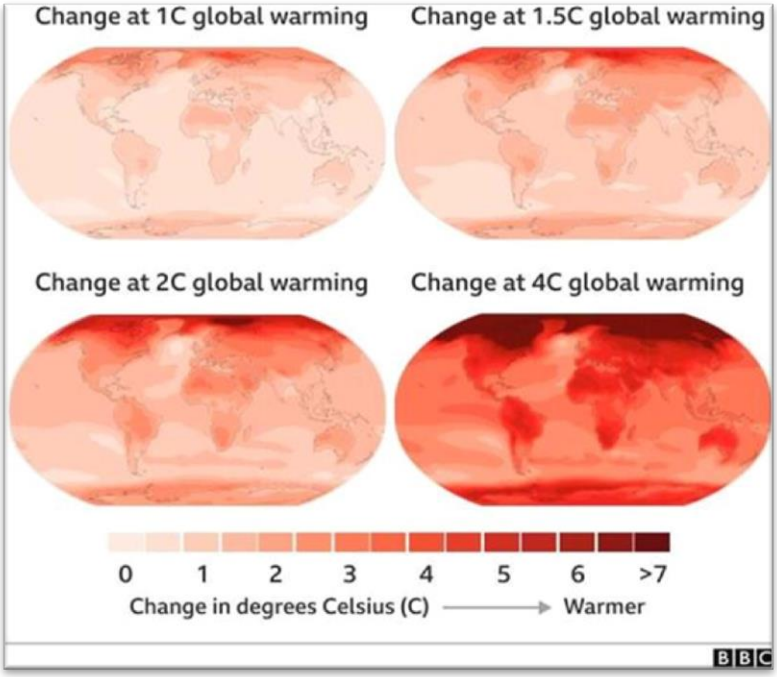

Figure 1: Transformation of Global temperature change variations for 1-4 degree Celsius (BBC, 2021)

Climate change brings severe health, food, housing and safety threat to Pakistan in its negative impact on the peoples' quality of life (Bhutto et al., 2020). It is most definitely affecting the country through modified and abrupt climate systems, raised temperatures, additional flood and drought prevalence and changes in rainfall distribution patterns – all which jeopardizes life support systems (Ullah et al., 2020). The increasing temperatures of the earth are quite alarming, particularly due to the fact that climate change is chiefly caused by global warming (Abouelfadl, 2012). Increase in the level of green house gases leads to increase in the heat absorption ability of the outer atmosphere of Earth, resulting into increase in the average temperature in the outer atmosphere which finally comes around to making an alteration in the climate of the place (Asif et al., 2023).

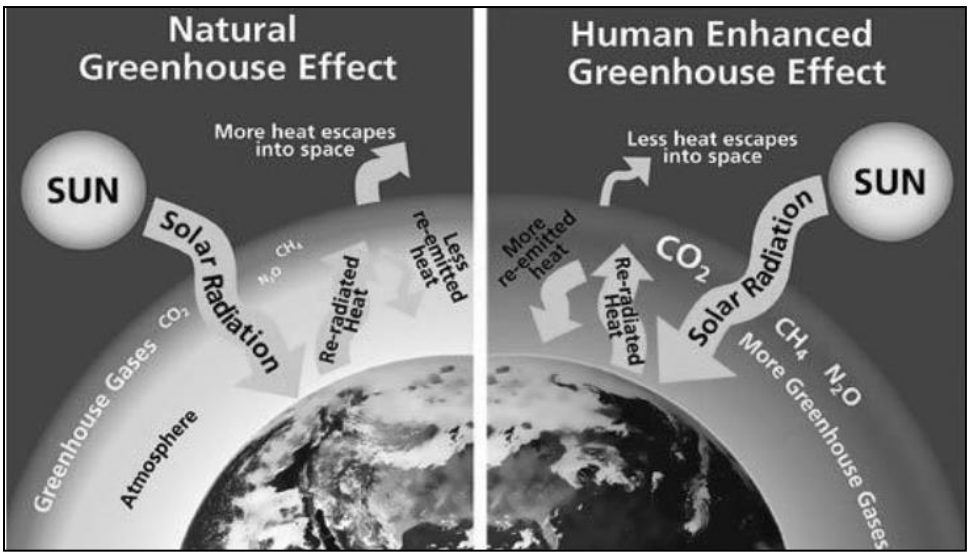

Figure 2: Natural & Human induced green house effects (Abouelfadl, 2012)

Pakistan accounts for little of global greenhouse gas emissions, but it is still highly vulnerable to climate change repercussions (Pandve et al., 2011). Pakistan's inadequate technical and financial resources for adapting to the negative effects of climate change lead to a worsening of its vulnerability. Food and water scarcity as well as security along with large population displacement are the principal threats confronting the nation at large (Sharif & Medvecky, 2018). Agriculture-based economy of Pakistan is especially at risk to increased irregularity and uncertainty regarding climatic factors. Like most other South Asian countries, Pakistan is dealing with considerable risk as a result of climate change (Mavrodieva et al., 2019). The "Climate Emergency" continues to define a strengthened worldwide attention on confronting climate change. Even though there is no single resolution to the various challenges presented by this crisis, each citizen has a responsibility to put their skills and actions to work addressing the serious threats to the natural environment, in both personal and professional settings (Fernandez et al., 2016).

Significant influences of climate change have become distinguishing in recent years in Pakistan through its severe negative impacts on the people, society and environment at large. The Indus river system has suffered major damages due to floods on a large scale in the last ten years. Also, regular droughts and heat waves are two results of the changing climate within the country (Oruonye, 2011). Effective policymaking highly depends on the insight into how local communities view climate change adaptation strategies. The complexity of impacts due to climate change is making Pakistan more and more vulnerable each day. Pakistani government policies and laws regarding climate change exist, but the real difficulty is in implementing these initiatives, which is deeply associated with climate change awareness and literacy levels. Under the combined effect of all these elements, the Water Security, Flood Security, and Energy Security of the country are seriously at risk. Framing these problems are the forecasted heightened risks to coastal areas and the Indus deltaic region brought on by sea level rise, coastal erosion, saline sea water intrusion, and rising summits of cyclonic activity in the Arabian Sea. Found in the hot zone, a rise in temperature would have harmful effects on human health resulting from heat strokes, diarrhea, cholera, and vector borne diseases; and on human settlements due to frequent floods, droughts, and cyclones. The notions of adaptation to climate change and building resilience among both ecosystems and populations in response to climate variability and hazard threats are quite new. For this reason, the exchange of ideas and experiences, especially among delta areas, will have an important role in supporting specific ecosystem or site adaptation.

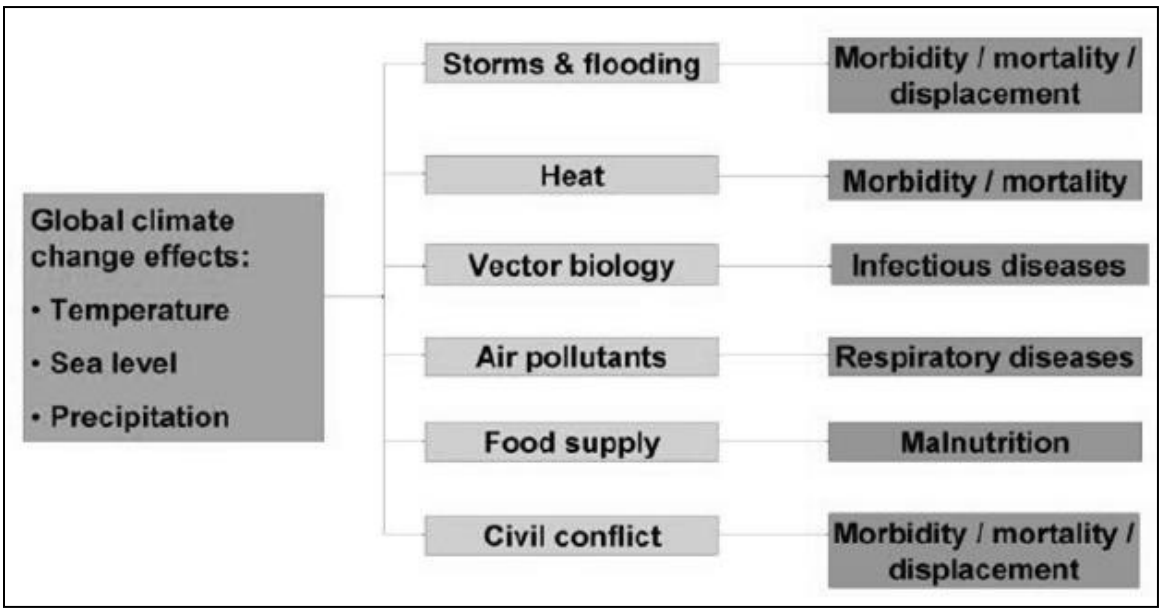

Figure 3: Global warming anticipated impacts on human health (Abouelfadl, 2012)

"Climate Emergency" still represents a challenge which requires immediate attention around the globe in confronting climate change. While one solution doesn't exist for the multifarious challenges presented by this crisis, it is important for every citizen, in their individual and work lives, to use their strengths and actions to lessen the profound pressures on the environmental world. Whether they are architects, urbanists, or members of the community, those invested in the design of buildings and cities have a crucial obligation to understand, and design accordingly for, the ramifications of climate change. With buildings responsible for 36% of global energy and cement causing 8% of global emissions, the architectural field greatly intersects with the flows concerning climate change - both in causation and solutions. In the context of climate change, construction of buildings plays a major role as a culprit. The 2019 Global Status Report for Buildings and Construction, coordinated by the United Nations Environment Programme, reports that in 2018, the building and construction sector made up 36 percent of final energy use and 39 percent of energy and process CO2 emissions. Emissions from buildings grew for a second year running after leveling between 2013 and 2016 in 2018. In order to achieve the targets set by the Paris Agreement and the UN Sustainable Developments Goals, the report pointed out that buildings must improve their energy efficiency by 3 percent a year, a standard that will call for considerable and broad efforts to fulfill. The threat to existence posed by climate change is substantial, and buildings play a critical role—even more so than that commonly recognized scapegoat, the automobile.

Under these circumstances and the severe crisis, it is evident that the role of architects and their design for the future of housing, shelters an cities is vital towards keeping in their contribution towards adaptation and mitigation of climate change challenges and how their design solutions may result in better future quality of life for the people at large.

3. Research Methodology

With an aim to identify the gaps with respect to the research exploration undertaken, following research methodology and major design aspects were defined. These are as under show in figure 04.

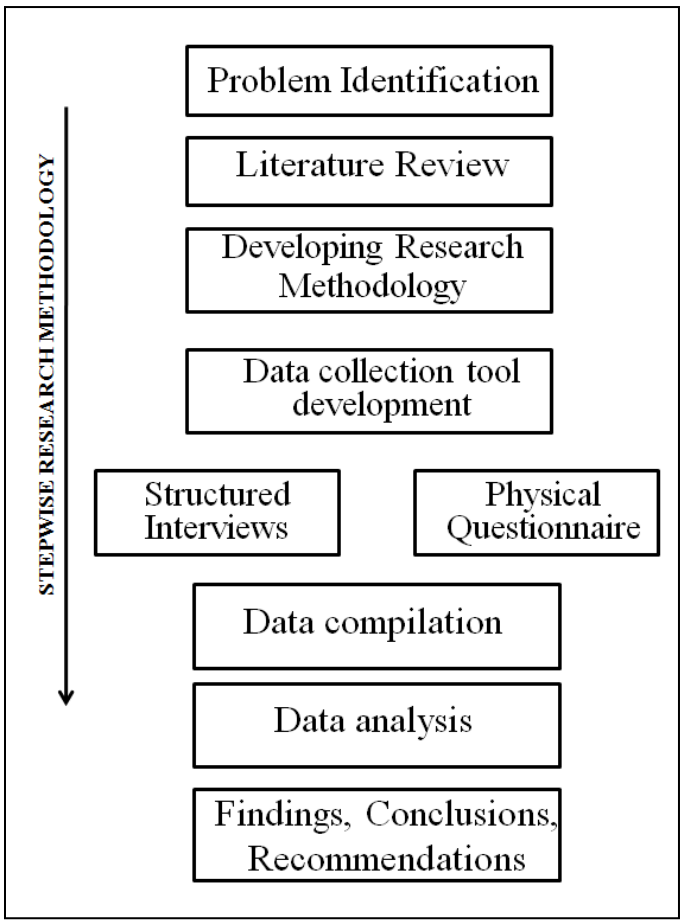

Figure 4: Phase-wise research program and major steps

As shown above in the figure 04, major steps were identified and followed. In problem identification, major observational study lead to identification of a gap which needed exploration and attention towards resolution. To accomplish the research exploration, the mentioned problem is analyzed with the help of existing literature. By using the explored research methodology, it was possible to determine some general stages related to research exploration that should be engaged and then developed a flow of data to meet the overall objectives of research. It was based on the explored literature review. After when the designing and the devising the whole mechanism to continue research, the most crucial process to assemble the primary data of the research problem was to have a tool to gather the data. Despite research exploration and literature review, the major aspects and their used modes were identified and thus lead in developing a tool to gather data from the respondents in the form of a questionnaire and also later in structured interviews wherever required. Gathering of the data from the respondents was done through physical administration of the questionnaires to them in their offices and construction sites. The questionnaire was distributed and respondent's were informed beforehand as to the current research being done and how each question has been constructed and what topics are covered in each question or aspect. Respondents were required to fill the questionnaires and return to complete other ones. For the purpose of the facilitation of the respondents prior discussion was also done. In few cases structured interview method was also used because some of the architects were using it to elaborate aspects in details. Data compilation after data collection was done using MS Excel. Therefore, compiled data was again substantiated by different statistical means for making clear about the nature of data and how explored variables and questions vary across different organizational contexts. Analysis was expressed and shared through graphical representation. Purposive sampling was used for sampling while respondents size was kept to 80 with major representation from the cities where architectural schools were teaching architecture degree programs. Related details are shared below in data collection and analysis.

4. Data Collection & Analysis

Based on the defined research methodology for the data collection process, researcher opted for two way approach to carry on further with respect to data collection phase. The two phases continued at the same time but had different directions. Phase one consisted of physical meeting and interviews with the architects in KPK from major cities where architectural practices as well as architectural schools are available and teaching architecture. The second approach was developed to manage time, cost and accessibility issues by developing an online questionnaire and sharing online with architects in the KPK through multiple platforms including emails, Whatsapp Groups and referencing. Data was collected using these two approaches.

In order to carry out the data collection, data collection tools in the form of a questionnaire was developed based on the review of literature. The questionnaire had multiple questions related to basic demographics and allied information based close and open ended questions to gather data with respect to impacts of climate change on the architectural practices and how they have been addressing the current issues.

Table 1: Questionnaire Key factors and variables

S.No	Key Section	Components
01	Demographics	Name, Age, Gender, Qualification
02	Perception	Knowing about climate change, part of formal study, major causes and major impacts awareness
03	Role for the architectural community	Why it is important, how it has impacted and what needs to be done.
04	Line of actions	Which methods have been used, which needs to be used, how these changes have impacted design domain, client responsiveness, etc.

As shown above in the table 01, there have been four major aspects with a total of 18 close and open ended questions with few opting for multiple choices as well to select the answers as well as tick and select choices. The questionnaire was kept versatile to better engage the respondent and ensure they have an interest in it. Each respondent in face to face interviews was briefed about and for the online questionnaire a detailed brief was provided prior to questionnaire to better help the respondents be able to answer the questions. Piloting was done with 5 architects and they were able to cope, understand and answer these questions. In order to carry out the data collection phases, a formal timeline was used to carry on the work so that a schedule could be followed and could better help manage the scope of the work. The schedule of visits related to three selected cities to meet architects in face to face interview as well as online questionnaire for data collection is shown below in table 02.

Table 02 Timeline of site visits in selected cities and online data collection from respondents

S.No	Location	Timeline	Respondents
01	Peshawar	1st & 2nd week October, 2022	20
02	Haripur	3rd week October, 2022	15
03	Abbottabad	4th week October, 2022	18
04	Online	1st week of September – 4th week of October, 2022	27

As shown above in the table 02, the total size of sample was 80. Three major cities visited included Peshawar, Abbotabad and Haripur while online questionnaire was also used to collect data. Physical site visits and meeting the architects in person are shown below:

Figure 5: Respondents data collection in person & interview process
With respect to the collected data and its major aspects are shown below:

Table 03 Respondents basic demographics

S.No	Variables	Options	Count	%
1	Gender	Male	72	90%
2		Female	8	10%
3	Age Group	Below 20	0	0%
4		21 - 25	6	8%
5		26 - 30	23	29%
6		31 - 35	41	51%
7		36 & above	10	13%
8	Qualification	Undergraduate	61	76%
9		Graduate	17	21%
10		Post-graduate	2	3%

As shown above in the table 03, 90% of respondents were male, 51% were between 31-35 age group and 76% had bachelors degree in Architecture. Questionnaire further explored about the perception and basic awareness about the climate change amongst the respondents. The data is shown below in table 04.
Table 4: Climate change perceptions

S.No	Question	Options	Count	%
1	**Have you heard the term Climate Change ?**	Yes	78	98%
2		No	0	0%
3		Not Sure	2	3%
4	**Are you aware of the term climate change and its meaning?**	Yes	75	94%
5		No	2	3%
6		Not Sure	3	4%
7	**Was climate change part of your study or any course in your degree at university level ?**	Yes	65	81%
8		No	12	15%
9		Not Sure	3	4%
10	**Do you think climate change is a threat to our environment ?**	Yes	76	95%
11		No	1	1%
12		Not Sure	3	4%

As shown above in the table 04, 98% of the respondents have heard about climate change, 94% were aware of it, 81% did had studied it as part of their studies and 95% believed that climate is a threat to our environment. Further questionnaire explored about the impacts of the climate change and how these impacts were evaluated as a result of climate change. The results are shown below in table 05.

Table 05 Climate change impacts perceptions among the respondents

Do you think climate is responsible for the following							
S.No	**Aspects**	**Yes**	**%**	**No**	**%**	**Not Sure**	**%**
1	Changes in rain pattern	75	94%	4	5%	1	1%
2	Changes in weather & seasons patterns	64	80%	8	10%	8	10%
3	Droughts	75	94%	2	3%	3	4%
4	Floods	76	95%	0	0%	4	5%
5	Temperature variations	72	90%	6	8%	2	3%
6	Longer Summers	61	76%	4	5%	15	19%
7	Small Winters	61	76%	8	10%	11	14%
8	Increase in number of severe weather days	71	89%	8	10%	1	1%
9	Do you think human beings are responsible for causing climate change ?	64	80%	8	10%	8	10%

As shown above in the table 05, majority of the respondents have answer in “Yes” for the climate change being a source of these major calamities shown above. One interesting fact which came forward was that being architects they did believed that human beings and architects being part of the society have also been a source of wrong doing which have resulted in the climate change. However one interesting part which came up during this discussion in interviews was a better sense of awareness that Pakistan and people in the Pakistan have not much contributed to the climate change. We being a developing country have not much contributed but have to suffer because of the developed nations which have resulted din large scale actions resulting in severe climate change. With respect to

the major causes of the climate change, respondents data is shown below:

Table 6: Causes of climate change

S.No	Question	Choices	Count	%
1	**Which major factors do you think are responsible for climate change? Tick all the relevant options:**	Global Warming	74	93%
2		Fossil fuels burning	78	98%
3		Deforestation	61	76%
4		Over consumption	64	80%
5		Food / Agriculture production	32	40%
6		Pollution	58	73%
7		Transportation	66	83%
8		Urbanization	71	89%
9		Non-renewable energy	74	93%
10		Mining & allied ore extraction processes	53	66%

As shown above in the table 06, the major reasons have been ranked. Fossil fuels burning 98%, non-renewable energy resources and global warming 93% were the major ones. The next aspect explored mainly focused on the architectural role towards climate change and how it needs the design industry inclination as a solution provider. All the respondents agreed that architectural community has a strong role to play in this aspects and they must get themselves updated, aware and identify the potential means to manage, mitigate and contribute towards better management of the issues faced by the KPK people. With focus on discussion towards the challenges faced with respect to the climate change issues and their implications on the architectural design industry, following major issues were identified:

1. Lack of awareness.
2. Lack of products in the market.
3. Very few case studies.
4. Poor accessibility.
5. Higher prices.
6. Lack of integration by relevant consultants including MEP, HVAC and allied.
7. Non cooperative governmental bodies and old rules & regulations.
8. Lack of updated knowledge about softwares.
9. Poor climatic data and non-availability of data.
10. Clients non-cooperation and lack of understanding.

With respect to some of the major techniques, technologies and design approaches used by the respondents to opt for green architecture and to manage the impacts of climate change (knowingly or even unknowingly) are shown below in table 07:

Table 7: Techniques, technologies and approaches used

S.No	Technologies, approaches & techniques used with respect to reducing the climate change impacts in Architecture	Count	%
1	Insulation	48	60%
2	Rain water harvesting	19	24%
3	Energy conservation	55	69%
4	BMS	23	29%
5	Building form analysis	41	51%
6	EIA	6	8%
7	Local materials	68	85%
8	Solarization	51	64%
9	Climatic data usage	12	15%
10	Green roof	26	33%
11	Waste management	12	15%
12	Water recycling	4	5%
13	Solar energy	61	76%
14	Wind energy	15	19%
15	Material re-usage	43	54%

As evident from the above table 07, the most extensively used options included local materials, energy conservation, solar energy for lighting and heating, solarization and insulation.

4.1 Discussion & Analysis

Based on the above data it was evident that architectural community is active in battling the climate change crisis through design interventions and strategies. However some challenges have been observed by the community too. These mainly included Lack of awareness, Lack of products in the market, Lack of specialized skillset, Very few case studies, Poor accessibility, higher prices of sustainability products with very less compensation from the government side in taxation, Lack of integration by relevant consultants including MEP, HVAC and allied which creates issues that even if the architects have incorporated these design interventions they were not managed and enabled in the operational side, Non cooperative governmental bodies and old rules & regulations also create hurdles where architects do try to incorporate elements like solar and wind energy harnessing but local governments show either no interest or lack support i.e. the case of net metering at a very low rate, Lack of updated knowledge about softwares and advanced analysis skill set is also not available in the local market.

One of the major issue faced included poor climatic data and non-availability of reliable data. Though PakMet have been there and have data but is not readily shared and integrating it into design solution is not easy. Another hurdle faced by the architects is the poor perception and lack of cooperation from the client end side as well where climate change and its impacts are not prioritized and hence architects even if proposing such design interventions for the building projects, either not get paid or not get executed in design at all. Poor socio-economic conditions are also a major hurdle. KPK has been on the fore front of sustainability and UN Sustainable Development goals targets yet, built environment and its vital role is mainly ignored by all major sectors of the society and government due to higher costs and lack of interest.

4.2 Research Findings

Following were the major research findings of the project:

1. Climate change is evident and architectural community accepts that it is happening and is also impacting the people and the land of KPK province.
2. Architectural community is not only aware of climate change but most of them have already been taught about it

through formal educational system or through additional learning resources.
3. Architectural community believes they have a strong role to play in mitigating the climate change impacts on the people as well as the built environment.
4. It is still debatable that local development is not engaged in any form of major causes leading to climate change since any such activity at large scale to cause climate change has not been happening. This is mainly due to development done in the western advanced countries and the climate change impacts are felt in the developing world including Pakistan.
5. Though architectural community is getting ready, prepared and updated yet their knowledge and skillset is not strong enough to integrate the architectural design as a tool to reduce the large scale impacts of climate change in the context explored.
6. Lack of appreciation and acceptance amongst the stakeholders is a major issues faced by the architectural community.
7. Lack of awareness, Lack of products in the market, Lack of specialized skillset, Very few case studies, Poor accessibility, higher prices of sustainability products with very less compensation from the government side in taxation, Lack of integration by relevant consultants including MEP, HVAC and allied which crates issues that even if the architects have incorporated these design interventions they were not managed and enabled in the operational side once construction took place.
8. Lack of governmental appreciation of the strategies by the architectural community since local rules, regulations, byelaws and guidelines are not in correlation with climate change reduction or mitigation processes.
9. There is also lack of ample data which can be used using technical skillset and softwares which may help manage the design side to develop better passive solutions towards reducing Heating, cooling and electrical loads.
10. Another hurdle faced by the architects is the poor perception and lack of cooperation from the client end side as well where climate change and its impacts are not prioritized and hence architects even if proposing such design interventions for the building projects, either not get paid or not get executed in design at all.
11. Public poor socio-economic and financial conditions have also created hurdles for such design integration since its initial cost is high.
12. With higher rates of inflation, equipment and technology required also becomes hard to access and purchase.
13. With all existing limitations, architectural community still has been able to top for multiple green technologies which included local materials usage, energy conservation, solar energy for lighting and heating, solarization and insulation provisions in building design.

5. Conclusions & Recommendations

Following were the major research conclusions of the project:
1. Climate change is evident and architectural community accepts that it is happening and is also impacting the people and the land of KPK province.
2. It was concluded that impacts of climate change like floods, droughts, heat waves, severity in cold weather, change in weather patterns, etc have also impacted the design industry in KPK and architects being on the forefront have been impacted towards enabling better design solution integrating green technologies.
3. Multiple local materials, local techniques and craftsmanship has been on the rise because of the need to manage these issues.
4. Architects are now working towards integration of solutions to address these changes through mitigation by implementing alternates to the existing design practices towards better user experience, cost effectiveness and energy efficiency.
5. One of the biggest challenge is lack of sensitization by the people and clients which crates hurdles towards design integration. Another factor which could also be contributed in higher inflation and initial higher cost of sustainable design solutions.
6. Practices evolving these solutions also require extensive climatic and weather data apart from site based analysis and design data which in most of the cases and projects are not readily available.
7. The tools, techniques, softwares and technologies to be used are not readily taught in our curriculum and hence it needs to become part and parcel just like teaching about climate change is now becoming an integral component.
8. Governmental policies at the moment are not conducive towards opting for integrated green design solutions i.e. a simple net-metering registration process takes weeks and client gets exhausted towards all such decisions.
9. Design analysis services and field operations data should be centralized so that each firm / architect may avail

these and could help develop better design solutions to mitigate the climate change challenges.
Following were the major research recommendations of the research exploration:
1. Climate change implication and related teaching should become integral part of the academia for all design and engineering domains including architecture.
2. Architectural community who have graduated like 10 or above years must be able to reach the academia through online resources to be taught about the climate change, its effects, its consequences, its causes and impacts on the local context.
3. Architectural community must be integrated by the governmental agencies and the local development bodies to ensure the design of the future buildings as well as the master planning and urban planning must have integrative solutions and considerations for the climate change as part and parcel for long term planning.
4. Climatic data be ensured to be updated, baselined and easily / readily available in the KPK context for the architectural community to make use in decision making related to design of buildings with respect to climatic conditions in different context and cities.
5. There must be provisions related to climate change issues in the design principles and applicable byelaws so that architects could also be directed to ensure design solutions have been there to address these concerns at large.
6. Governmental bodies, processes, SoP's and protocols etc must ensure that design solutions addressing these issues must be considered on priority and get approvals in time and allowed to integrate. Due to red carpet and ribbon cutting approaches in the system, the priorities change and hence the targeted efficiency and outcomes could never be achieved.
7. Import duty on the products, tools, gadgets, technologies and systems be reduced to help import such solutions in the local context.
8. Government should let the architectural community get licenses for the digital softwares related to design development, analysis, evaluation and integration for buildings to ensure they are more sensitive to the context and could be better solution to the issues identified.
9. Climate change with respect to built environment be prioritized so that people working in the AEC (Architecture, Engineering and Construction) industry could be facilitated and appreciated for better work opportunities and outcomes.

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