Impact of High Temperature on Human Behavior and Health in Dera Bugti, Balochistan- Pakistan

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Abstract

One of the issues that are very significant to the world in the twenty-first century is climate change. The country of Pakistan is always included in the 10 highly vulnerable countries to the changes of climate. The covered area is with much concern, Dera Bugti district in Balochistan in Pakistan due to the dry climate, infrastructural degradation and poverty. During summers, it is very unhealthy and lacks good productivity and psychiatrical stability due to the overheating that may exceed 45 o C. It is against this background that this paper analyzes the spatio-temporal variations of the temperature of Dera Bugti in 25 years (2000125) and determines its impact on human health and behavior. We investigated the satellite-obtained land surface temperatures records of CRU and MODIS using ArcGIS 10.5 to identify hotspots, map how they changed over time, as well as examine long-term warming behavior. Meanwhile, primary data were collected using structured questionnaires of 150 individuals residing in Dera Bugti as well as tabulated on the Microsoft excel and the regression and correlation analysis done to examine the relationship between increasing temperatures and human consequences in a statistical manner. The findings indicate that the maximum and minimum temperatures in Dera Bugti increase every year. Sui, Pir Koh and Dera Bugti are all regions of central and southern region of the country that experienced high temperatures. It had a considerable impact on the behavior of the people when exposed to extreme heat, with 47 per cent indicating they were angry and frustrated, 20 per cent indicating that they were tired and unmotivated, 13 per cent indicating that they were stressed and anxious, and 10 per cent indicating that it affected them by making them uncomfortable and having depressive symptoms. The healthcare consequences were also high: Headaches (30%), thirst (23%), increases (20%), and exhaustion (20%): were the most frequent, and old adults and outdoor workers were the most vulnerable. The regression results had demonstrated that there are intermediate positive correlation between an increase in temperature and behavioral problems and an inverse relationship between an increase in temperature and productivity. The outcomes demonstrate that the insufficient heat in Dera Bugti is not merely an environmental issue, but a complex issue,

which impacts on the physical health, psychological stability, social cohesion, and economic stability.

Keywords: High temperature, Human health, Human behavior, GIS, Regression.

Introduction

Another important challenge of the twenty first century in green environment is climate change. According to scientific data, by the close of the nineteenth century, the average temperature of the surface has been raised by about 1.1 o C, which is mostly the result of human activity, including burning of fossil fuels, deforestation, and high-speed urbanization. This has led to increased heatwaves, droughts and other extreme weather conditions in various parts of the world causing significant risks to both the ecosystems, the economy and even human lives. Countries that are developing are especially sensitive due to lack of resources and adaptive capacity. In this regard, Pakistan is always leading the list of countries that are most vulnerable to the effects of climate changes (Field et al.,2012).

In Pakistan, increasing temperatures and occurrence of heatwaves is on the increase in the last twenty years with dire effects on the human population, water and means of living. The recent heatwave in Karachi in 2015 that killed over 1,200 people is an indication of increasing threat posed by extreme heat in the country. Although some research has been conducted on major cities of the country, little is known about areas that are remote and underdeveloped. One such area is the Dera Bugti district in eastern Balochistan which is one of the most climate-sensitive regions as it is arid with extremely hot summer temperatures reaching up to 45 o C and lack of infrastructure, electricity and poor healthcare services. Such situations expose and predispose the local population to risk factors related to heat (Khan et al.2019).

This predicament of Dera Bugti is also further compounded by the overall climatic and socio-economic situation of Balochistan. The province is also characterized by little rainfall, frequent droughts, weak ecosystems, high levels of poverty, and low institutional capacity that lowers the capacity of the communities to absorb environmental stress. In these environments, there is not only the direct impact of extreme heat on physical health manifesting as dehydration, heatstroke, and cardiovascular stress, but several approaches to mental health and behavioral reactions. Other related studies performed in various regions of the world have reported high temperatures as a cause of anxiety, irritability, aggression, lack of sleep, and low productivity in the workplace (Khowaja et al.,2021).

A number of international and national researchers have identified the connection between temperature and human health consequences in terms of higher mortality rates, heart-related issues, psychological stress. Studies conducted in China, urban Pakistan and India have shown that fatigue, decreased concentration and emotions instability are caused by long exposures to intense levels of heat. Nonetheless, the majority of such researches could concentrate on urban settings or national-scale evaluations, with the local evidence in remote and arid countries like Dera Bugti existing in small numbers. The effect of high temperatures on behavior and productivity can be stronger in these regions where mental health services

are absent; the level of awareness is low; and people rely on outdoor livelihood (Johnson et al.,2011).

With the growing risks there is also a huge gap in the research about the spatial pattern of the change in temperature and its direct social consequences in Dera Bugti. Knowledge on the location of temperature rise that is most intensive, and responses to heat stress among communities would be very important in creating effective planning and adaptation to climate change. Thus, the current paper will examine the spatial-temporal patterns of temperature in Irrigue de 2000 a 2025 with the help of satellite images and evaluate the effects of warming on people and their decision-making with the primary survey analysis. The proposed study will combine spatial analysis with socio-economic data to provide some evidence of location-specific interventions and policy measures to help decrease climatic vulnerability in this dry area.

Dera Bugti is one of the most climate sensitive districts in Balochistan which is classified as arid climate, regular occurrence of drought conditions, minimal vegetation cover coupled with poor socio-economic infrastructure. Annual average temperatures are so high (more than 45C) and water is scarce during the summer and electricity is at times inconvenient and the health care facilities are few. The conditions make local people more susceptible to heat stress and lower the adaptive capacity of the target population. Although the region is highly vulnerable, no studies have been conducted with the localized effects of increment in the temperature in human health and behavioral responses. Thus, this study intends to close this gap by studying the trends in temperature over the long-term and evaluating their social and health consequences in Dera Bugt.

Study Area

Dera Bugti is a district in the Eastern section of the province of Balochistan, Pakistan. Geographically it is located between longitudes 68°16′ to 69°48′ East and between latitudes 28°28′ to 29°40′ North. The district shares its borders with several important administrative regions. On the north it borders Kohlu Agency; and on the south, the Jacobabad district of the Sindh province. To the east it borders the districts of Dera Ghazi Khan and Rajanpur in Punjab and to the west, the Nasirabad and Bolan districts of Balochistan. This strategic location places Dera Bugti at a junction of three provinces: Balochistan, Sindh, and Punjab.The name dera Bugti is coined out of two terminologies; dera which is a local language meaning abode or settlement and Bugti, the name of the powerful tribe group that makes the major population in the area. Thus, the name Dera Bugti means the dwelling of the Bugtis, not only the territorial origin of the land but the strong tribal legacy of the land. Bugti tribe has a strong impact on the social, cultural and political environment of the district.

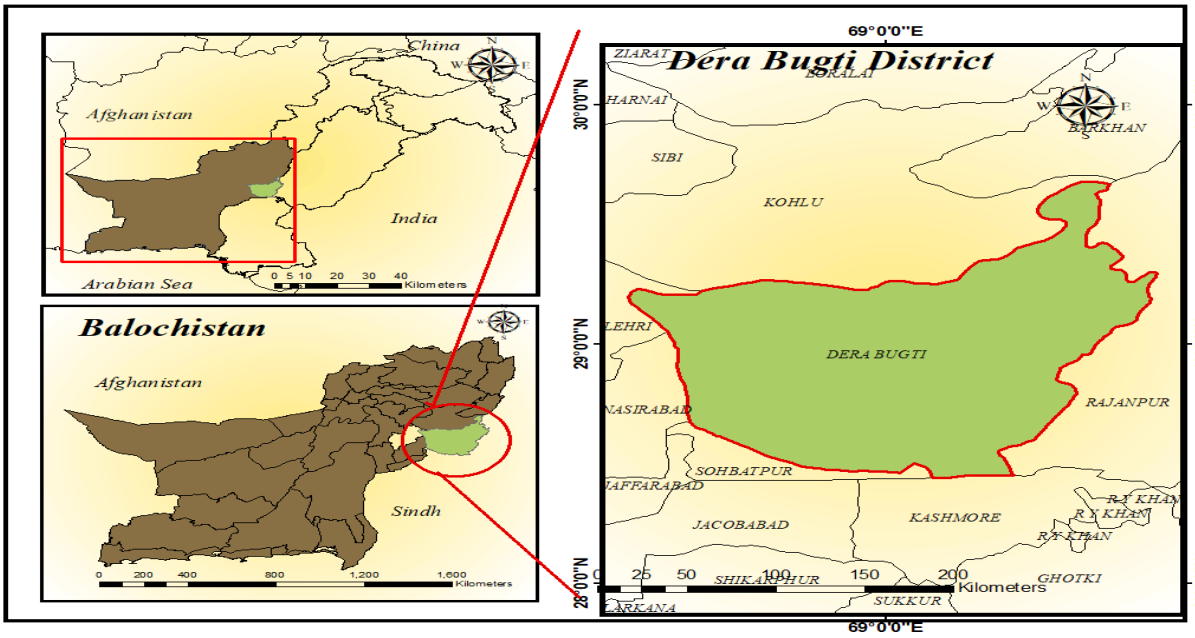

Figure 1: *Location of Study Area*

Data collection and Analysis

The proposed study adopted an integrated approach where use of the satellite data with the main field survey was done so as to examine the spatio-temporal pattern of temperature and its impact on human behavior and health in the Dera Bugti district.

The Landsat scene was retrieved at a spatial resolution of 30 m and the MODIS Land Surface Temperature (LST) products (spatial resolution of 1 km) retrieved in 2000, in 2005, 2010, 2015, 2020 and 2025. The images have been discovered in the National Geological Survey of United States (USGS) Earth Explorer. The datasets were selected in order to analyze the patterns of long-term temperature variability and patterns of spatial distributions in a 25 years period (2000- 2025).

Several steps were used to download the required ArcGIS 10.5 which was used to image preprocess and extract the temperature. The Landsat and the MODIS images were, firstly, geometrically adjusted and transformed into the WGS-84 coordinate system so as to generate spatial consistency. It filtered scenes of poor quality and clouded to obtain accuracy in data recording. They were subsequently mosaiced where the need was and clipped as per the administrative boundary of the Dera Bugti district.

So as to retrieve the Land Surface Temperature (LST) the thermal bands of Landsat were utilized where radiometric calibration and digital numbers (DN) to spectral radiance were involved. This was changed to the brightness temperature. Surface emissivity was to be corrected to obtain correct values of land surface temperature. The changes with time, temperature, spatial distribution maps were designed with a year of choice in order to determine the changes in the last temperature layers.

Hot spot analysis was done using Getis-Ord Gi* statistical tool in ArcGIS to tell where there is congestive heat. This technique worked well in determining the statistically significant high and low temperature clustered as in the district. Spatial projections were prepared at 30 m as Landsat based as well as 1km in case of MODIS.

The data was also collected through primary data collection methods which included a systematic questionnaire survey as well as satellite analysis to determine the effect of high temperature on the human behavior and health. On the grounds of exposure to climate and the geographical location, one hundred and fifty respondents were sampled in four tehsils of Dera Bugti. The survey was conducted on the field between January-March 2025.

The questionnaire involved information regarding demographic factors, health challenges, behavioral responses and perceived responses of the extreme heat concerning the response. Obtained data was tabulated and analyzed with the aid of Microsoft Excel and SPSS. The descriptive statistics summary summarized the responses and a linear regression and correlation analysis were performed to test the relationship between the rising temperature and outcomes of the behavioral and productivity.

The integrated approach logical model allowed the research to mediate the overtime spatial changes in temperature on human health and behavioral outcome providing an in-depth assessment of climate susceptibility within the area of study.

Results and Discussion

Spatio temporal Temperature variations during year 2000-2025

The present study examined the changes that occurred in temperature within the study region in last 25 years. The climatic history shows that Dera Bugti is always hot in the summer with an average temperature of 45°C to 51°C during the hottest months. These conditions are physically demanding and cannot be withstood by humans thus triggering physical and psychological stress reactions. Summers in Dera Bugti are heatwave-ridden with heatwaves in many cases lasting weeks. During the daytime temperatures often rise above the temperature at which humans can feel thermally comfortable, which increases the probability of dehydration, heatstroke, and poor performance at work. Winters are however capable of extreme declines in temperature, sometimes even reaching or below freezing in some higher places. This extreme summer and comparatively low winter temperatures show that there are climatic extremes in seasons of the year in the district.

It can be seen from figure 2 in which the red line represents the highest annual temperatures recorded on a yearly basis. There are minor oscillations, and major peaks occurred in 2002 and 2003. A rising or continually high maximum temperature can mark an increase in frequency of heatwaves and warming climate trends in the region. This affects farming, water use and human health, especially at extreme summer temperatures. Minimum Temperature in Blue line shows the lowest annual temperatures recorded. Minimum temperatures are less varying as compared to maximum temperatures, but they also show an increase or a negative pattern in some years. The rise in the minimum temperatures over time could mean that there are warmer nights and this could affect crop grow cycles, livestock

health and ecosystem balance. Mean Temperature withgreen line refers to the average temperature per year, based on the highest and lowest data. Mean changes in temperatures can be used to assess high-level climatic warming or cooling trends. The slight rise in average temperatures in decades can have considerable impact on the patterns of precipitation, groundwater evaporation, and biodiversity.

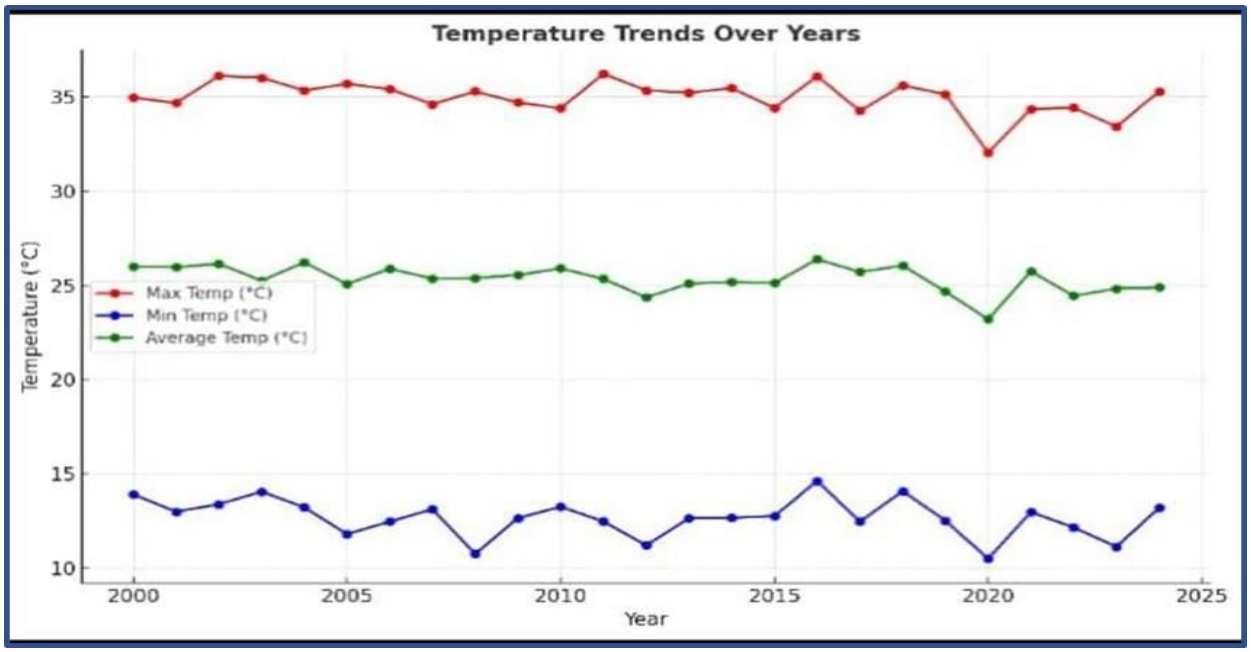

Figure 2: *Maximum, Minimum and Average Temperature*

The regional distribution of mean annual temperature in District Dera Bugti from 2000 to 2005 reveals significant climate diversity throughout the region as shown in figure 3. Temperature values are displayed in the map in different ranges with the smallest (10.18-11°C) being the lowest and the highest (14.09-14.6°C) being the greatest. The North Eastern part of the district, especially the Sui Tehsil area is shown in blue and green colours, which depict lower temperature divisions of 11°C to 12.8°C. This indicates that Sui was subjected to quite mild climatic conditions in comparison to the rest of the region. As one moves towards the middle belt and towards Pir Koh Tehsil, the colors shift to yellow and orange signifying the rise in the average yearly temperatures of between 12.8°C and 13.6°C. The area is classified as being as moderately warm, and it is a transition zone between the cooler northeast and the hotter southern regions. The Dera Bugti Tehsil is located in the south and southwestern regions and has hues that go through the shade of orange to deep crimson. The colours represent the highest observed mean annual temperatures, and this ranges between 13.6°C to 14.6°C marking this area as the hottest in the district. The figure shows that temperature is increasing steadily in the north and northeast to the south and southwest forming a clear gradient of thermal intensity across the district. The anomaly in the distribution of temperatures can be traced to the geographical and topographical factors with the elevation, terrain, and local climatic factors playing major roles.

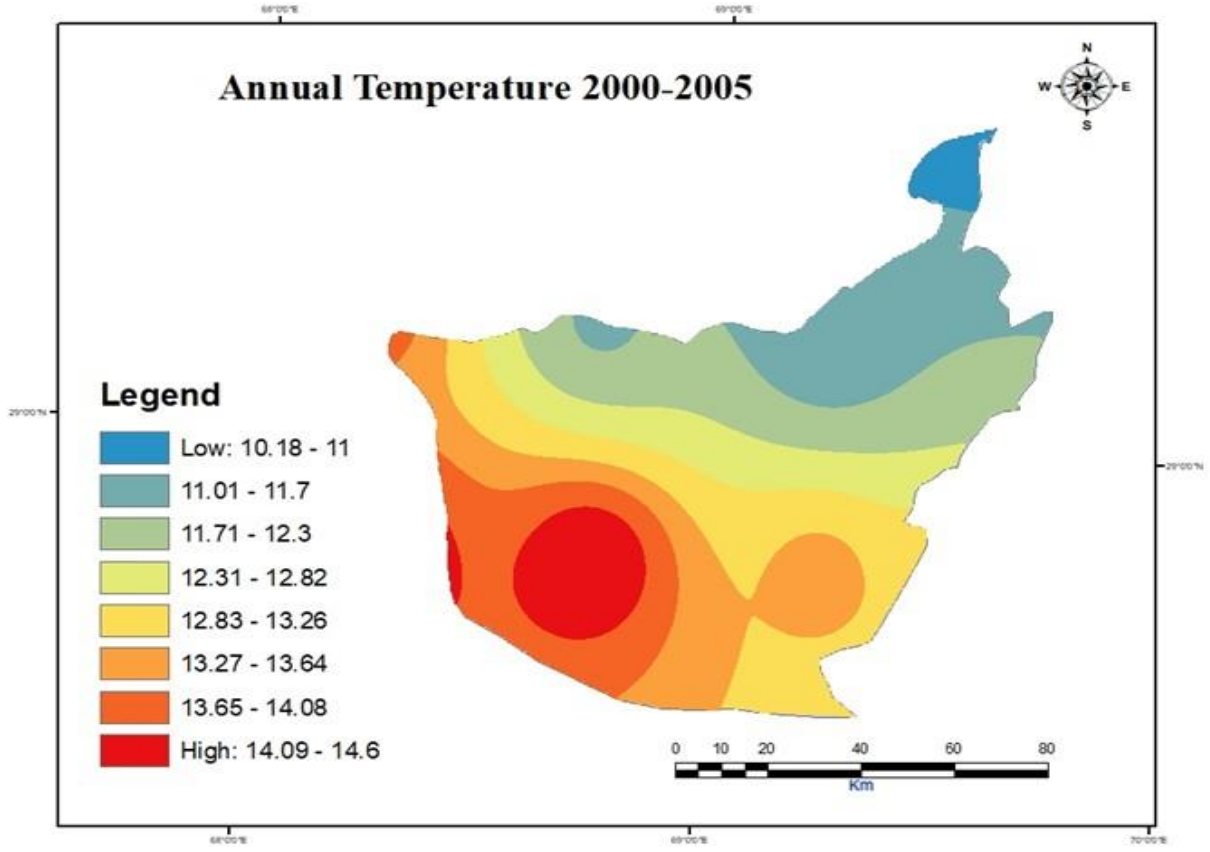

Figure 3: *Spatial Pattern of Mean Annual Temperature (2000-2005)*

During the year 2005-2010, the northern, middle, and southern sections of the district display substantial variations in the spatial pattern of mean annual temperature. The temperature ranges are indicated on the map legend as the lowest point, 9.88°C to 10.8 °C in dark blue, the highest point, 14.1°C to 14.9 °C in dark red. The coolest spots in the district, covered with blue tints are in the hilly north, where the lowest annual temperatures lie between 9.88°C and 11.4 °C. Taking a trip to the south of the District, one will find that the middle and eastern areas are found in moderate climate zones the average annual temperatures are between 11.5 to 12.5 degrees Celsius. This area covers a large part of the middle tehsil of Dera Bugti which implies the existence of a more even environment compared with other regions. Farther south and southwest you will find the range of temperatures between 12.6°C and 13.9°C in yellowish-orange colors on the map. This zone is so large all through the Pir Koh region and this is a pointer that it is a bit hot there. The hottest weather is on the southern side of the district, particularly in the coming Tehsil Sui which is in the orange to dark red region. Sui is the warmest tehsil of the country at this time of the year and has a temperate of 13.5-14.9 degrees Celsius on an annual basis. The map shows a broad pattern of increase in temperatures as one travels northwards and southwards where the coolest climate is in the northern highlands and the hottest in the southern plains. The variability of the climatic variables in the district is depicted by the fact that the average temperature in each tehsil varies and the north and east are moderate and cool whereas the south, which houses Sui, is characterized by intense heat.

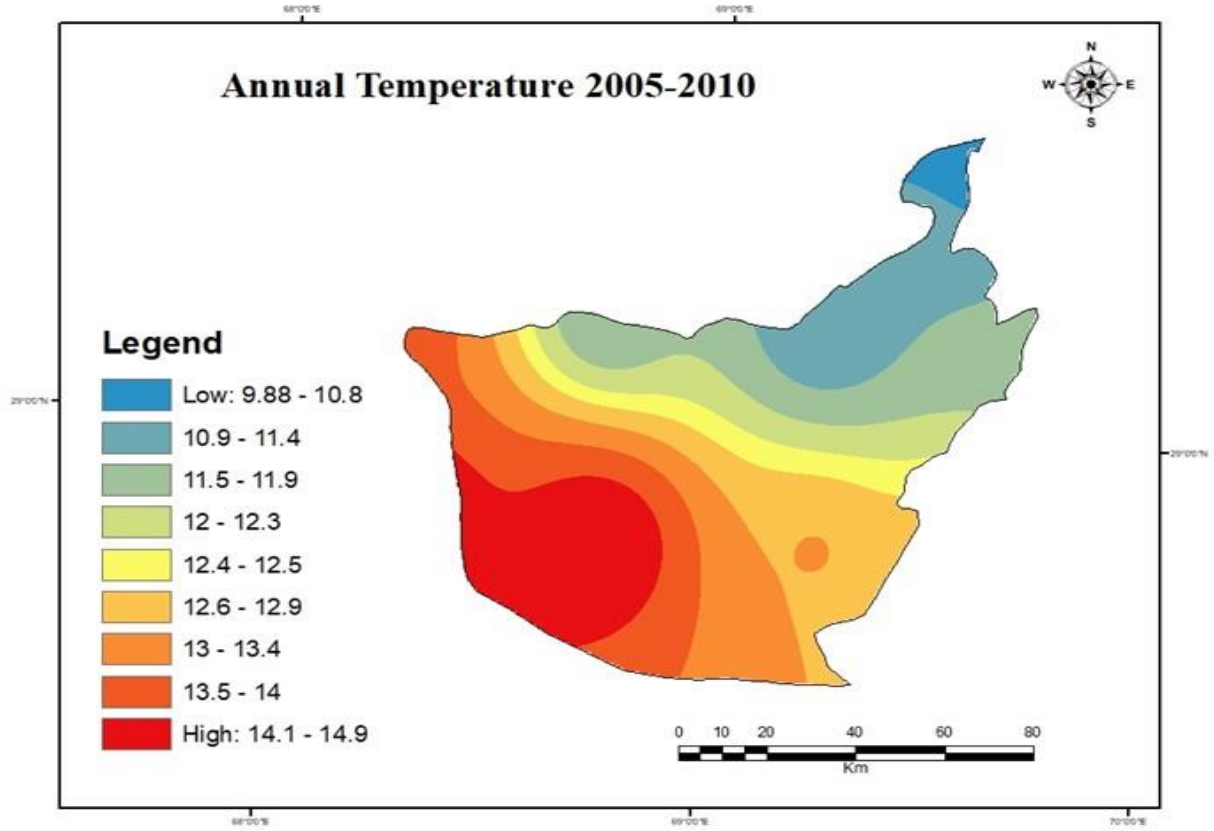

Figure 4: *Spatial Pattern of Temperature in Dera Bugti (2005-2010)*

It can be seen from figure 5 the heterogeneity of climatic conditions in the district. The legend used in the map has employed a color gradient of blue to red in order to divide the temperature ranges into the lowest point of 9.9 °C and the highest point of 14.9 °C. The blue colors represent cooler areas and is considered as a temperature that ranges between 9.9 °C and 11.0°C whereas green colors depict moderately chilly areas, and is considered as a temperature that ranges between 11.1 °C and 12.7 °C. The more moderate warm temperatures with an average temperature ranging between 12.8 °C and 13.8 °C are defined by the yellow and orange coloring as the temperature increases. The hottest zones indicate the highest recorded average annual temperatures of between 13.9 °C and 14.9 °C as illustrated by dark orange and red colors. This is shown by the spatial distribution, which shows that discrepancy by tehsil is high. The hottest area of the district is Tehsil Sui in its southern part and the average annual temperature is between 14.0 °C and 14.9°C because it falls in the red and dark orange regions. This means that Sui will be hotter than the rest of the district. The area of Tehsil Pir Koh is in the orange to yellow zone meaning that the average annual temperature is between 13.0°C and 13.8 °C and is relatively high. The climate of the central part of the district including the headquarters of Dera Bugti is characterized by moderate conditions, the average annual temperature being 12.0 °C to 12.8 °C. The space is mostly sprayed with yellow and light green color. The hilly areas to the north fall in the blue zone which has an average temperature of between 9.9°C and 11.0 °C every year and thus making these places the coolest regions in the district. The eastern part of the area is

dominated by green and light blue colors, and the temperature of the land varies between 11.0 °C and 12.0 °C per year, which would mean moderately cool conditions. To conclude, the spatial distribution of temperature shows a drastic difference between the warm central and western areas (Pir Koh and Dera Bugti), the hot southern area (Sui), and the cool north and eastern areas, hence providing an all-inclusive explanation of the variation of temperature throughout the district.

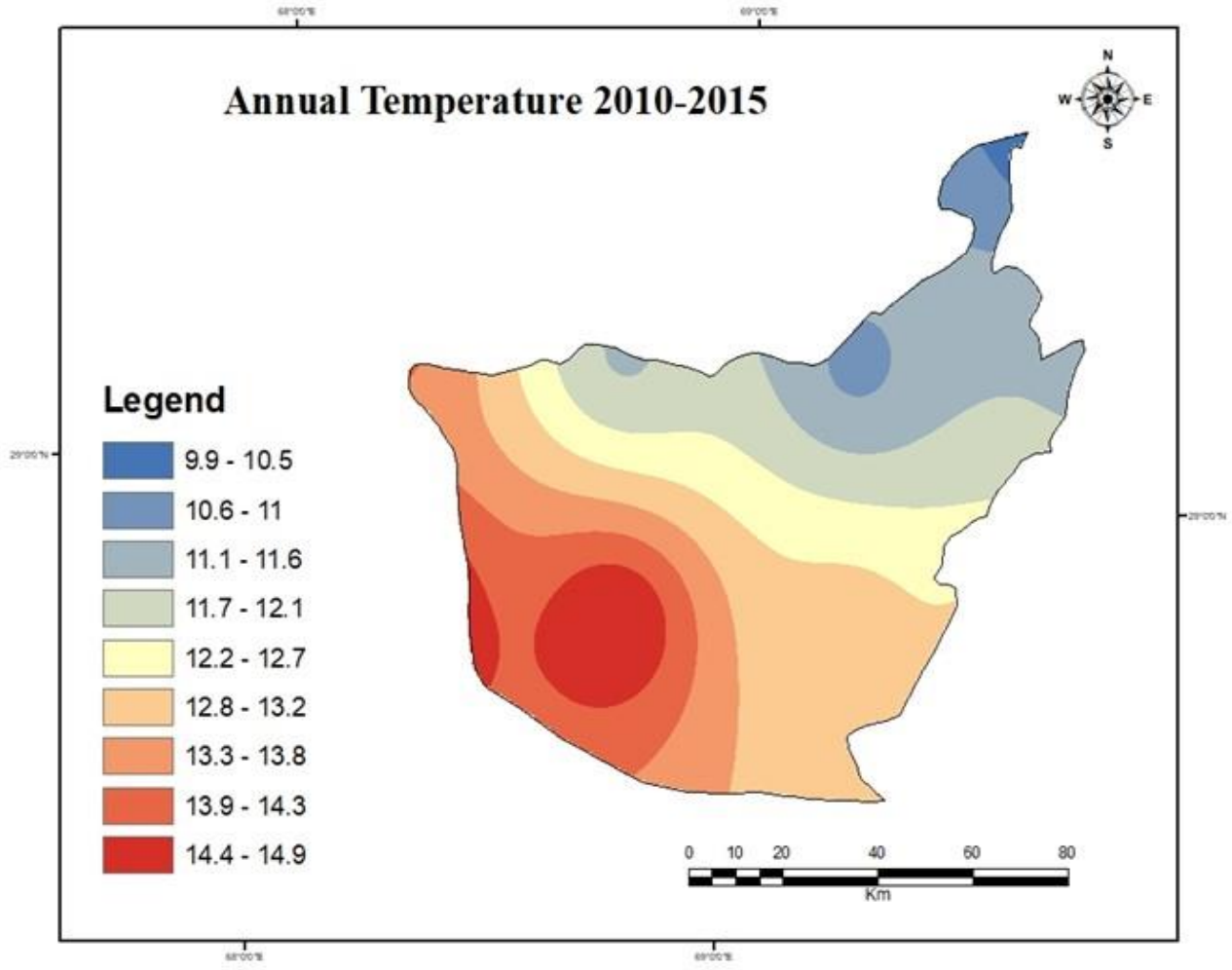

Figure 5: *Spatial pattern of Temperature in Dera Bugti (2010-2015)*

The regional distribution of mean annual temperature in Dera Bugti District from 2015 to 2020 reveals distinct climate variations among its several tehsils. The central and southern parts of the district, in particular, the Dera Bugti Tehsil and Pir Koh, have the highest mean annual temperatures and are mainly located within the red zone (16.9- 20.9 °C). This implies that the areas experience the highest level of extreme temperatures that have direct impacts on the livelihoods pattern, farming, water resources, and human life of the local residents. Sui Tehsil is mostly characterized by the yellow (13.5-14.9 °C) and orange (14.9-16.9 °C) temperature in the eastern and south-eastern regions, meaning moderately high temperatures, which are rather lower than in the centre of Dera Bugti, though higher than in

the north. The location of Phelawagh Tehsil falls within the yellow and orange temperature ranges (14-16 °C), meaning that its climate would be moderate to warm, thus define it as an intermediate zone between the warmer southern part and the colder highlands of the north. On the other hand, the mountainous area in the north, and in particular around Nahri and the adjacent hill systems, is characterised by a blend of blue and greenish tones(9.9-12°C).

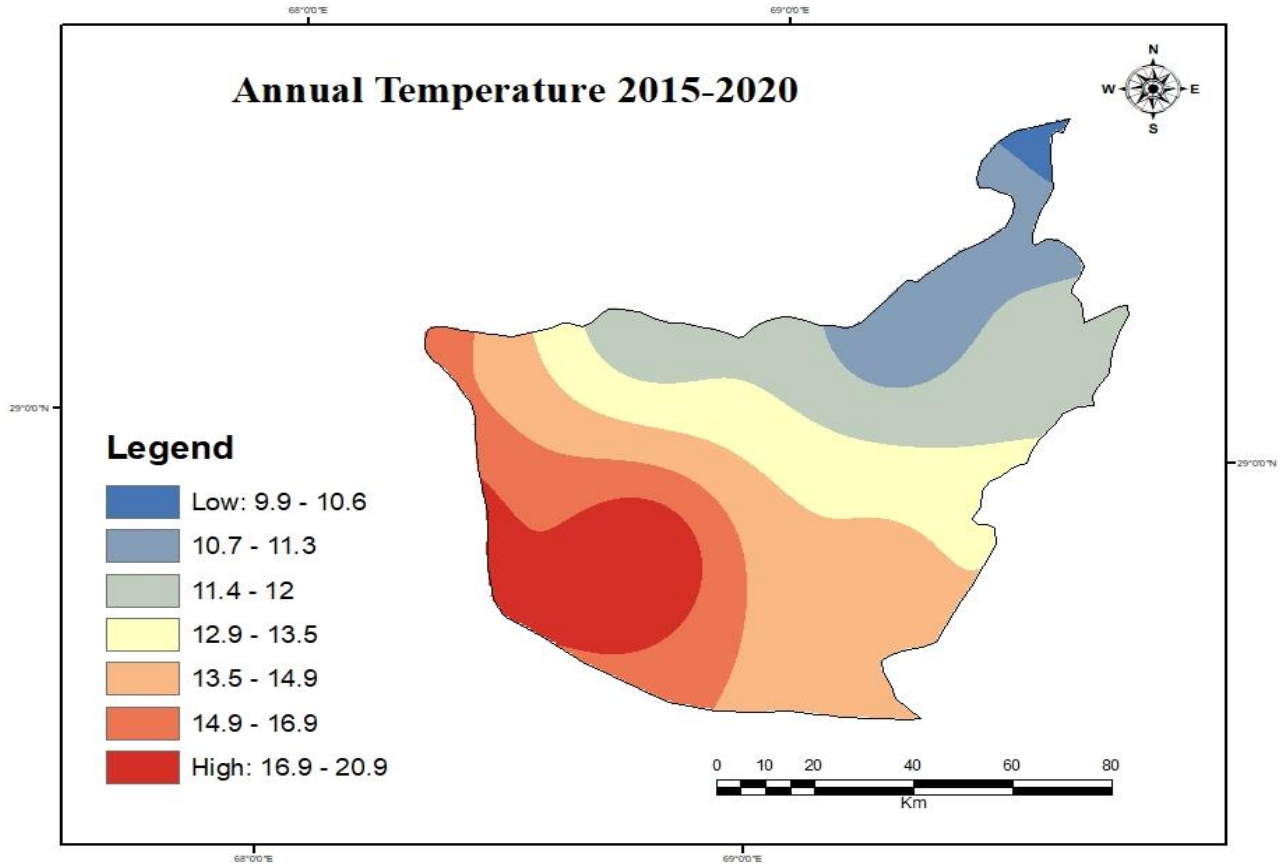

Figure 6: *Spatial Pattern 0f Mean Annual Temperature (2015-2020)*

In years 2020-2025, the average annual temperature in the Dera Bugti District will increase considerably as compared to the last period (2015-2020), with an evident climate gradient running north-south. The red to dark red zones (24.6- 32.9°C) are in the central and southern tehsils with special reference to Dera Bugti and Pir Koh. This implies that these have now become the hottest areas within the district, where the heat is too excessive and it is not good to farming, keeping of animals, water supply and even human health. Sui Tehsil, however, is largely within the temperature ranges of orange (16.1-18.8°C) and light red (19.9-23.5 °C) implying that the temperatures there are fairly high but not as high as in Dera Bugti and Pir Koh. Nevertheless, the temperatures continue to increase as compared to the earlier period. In addition, Phelawagh Tehsil consists of an orange and slight red zone (16-23°C) that portrays moderately hot weather that serves as a buffer area between the extremely hot southern and central areas and cooler mountains in the north. The mountainous belt to the north, encompassing Nahri and the hilly ranges enveloping it, remain largely blue (10.6-14.3°C), indicating it is quite a cooler and temperate region in contrast to the south extreme

heat. On the whole, the work indicates that northern mountains remain the coolest. Nevertheless, south and central tehsils are rapidly increasing with the temperatures reaching up to 32.9 °C in average per year in certain locations. This increase in warming during the years 2020-2025 illustrates the fact that Dera Bugti District is increasingly exposed to climate change and heat stress which might have adverse impacts on the livelihood of the local population

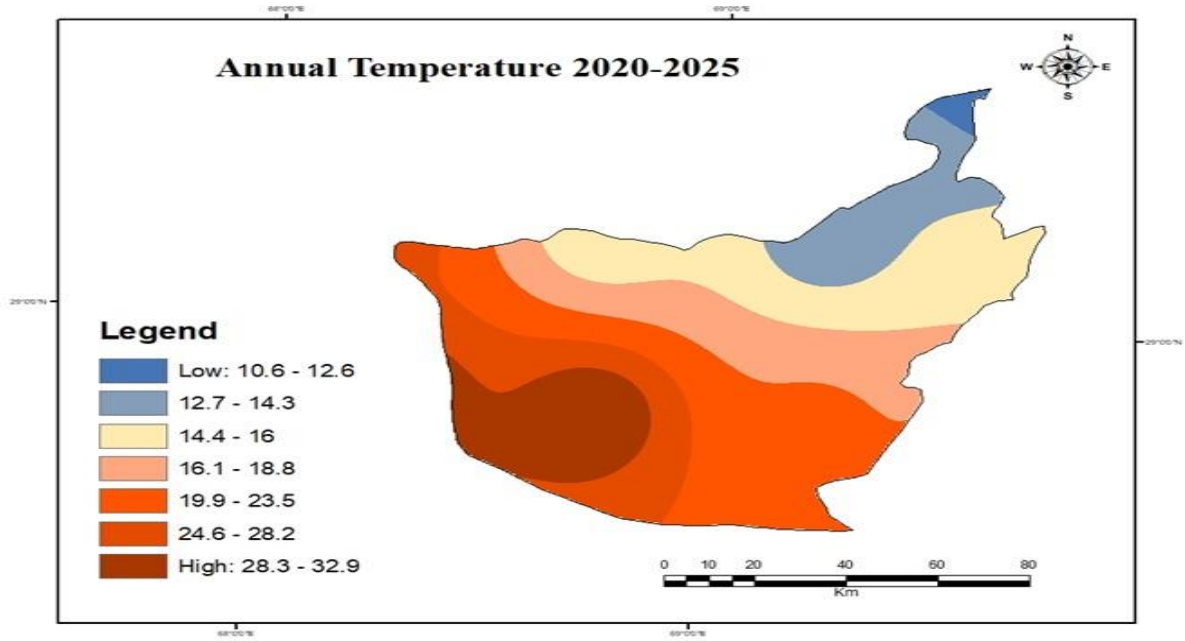

Figure 7: *Spatial Pattern 0f Mean Annual Temperature (2020-2025)*

The Dera Bugti hotspot analysis map (figure 8) illustrates areas of diverse degrees of intensities, both extremely low and extremely high. There are five types of hotspots based on the map legend: colors used are Green, Very Low, Moderate, High, and Very High. This categorization can be more useful in understanding the relative stability of the district and areas where stress is most likely to take place. The low areas, shown in the dark green and green color, include the east and northeast areas of the district, which are close to Barkhan and Dera Ghazi Khan. These regions have less disruption and are more stable. A moderate area of hotspots (yellow) refers to average intensity and medium levels of activity concentration as one approach the Centre of the district, namely, towards Dera Bugti tehsil. There are high and very high hotspots with orange and red color in southwestern and western part between Nasirabad and Jaffarabad. The southern half seems to be under the greatest focal point of stress or activity, maybe because of population pressure, resource usage, or socio-political circumstances because the highly hot zone of liquidity (red) is concentrated at the Centre. Owing to its central position as an activity and resource exploitation hub, Tehsil Sui is highly clustered around the high and very high hotspot areas when discussing distribution in terms of tehsil. Most of the Tehsil Dera Bugti (central) lies in the moderate intensity region indicating a balanced but clear intensity. The Tehsil Pir Koh is more active than the Centre of Dera Bugti since it falls within the high hot spot range. The northern and northeastern areas that extend to Barkhan, are still considered to be low to very low meaning

they are more stable and less exposed. The overall analysis of hotspots can be evaluated as a gradient: the positions of the north and east are stable and low-intensity, zones in the south and southwest, which are particularly affected by Sui and the nearby areas, are high- and extremely high-intensity.

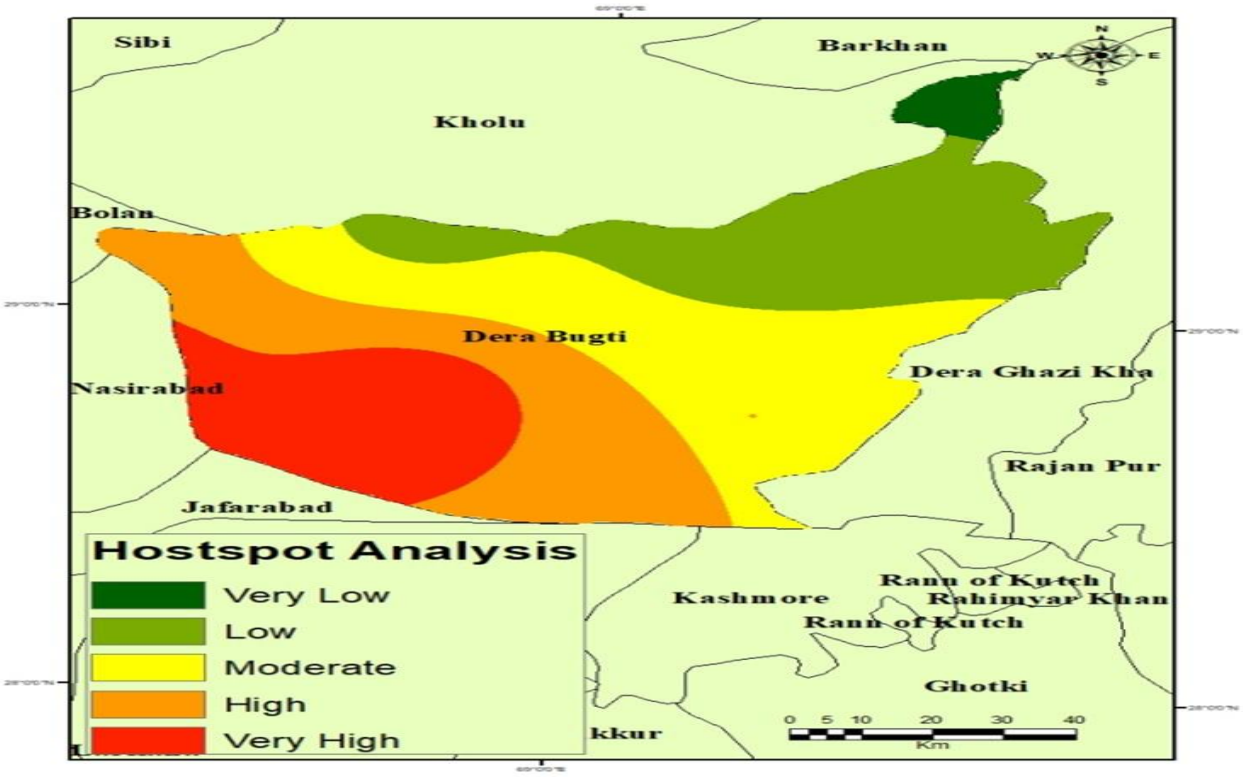

Figure 8: *Hotspots Analysis of Dera Bugti District.*

Demographic characteristics of the respondent

The demographical survey of the respondents giving an idea of their gender, age group, the education levels and the health effects that they identified. Most of the participants were men (76%), and 24% of the respondents were females out of the 150 participants. The age of the majority of respondents was between 25-40 years (70%), then 41-60 years (16%), and 61-75 years (14%). The educational level was heterogeneous as 44 percent had no formal education, 36 percent had completed matric, and 20 percent were graduates. Regarding health effects, it was also found that headaches were the most commonly reported (30%), then dehydration (23%), blood pressure and fatigue (20% each) and the least frequently reported were heat rash (7%). The given demographic breakdown shows that the population is mostly composed mainly of young to middle-aged men with low educational levels with a variety of health problems, especially headaches and dehydration.

Table 1: Demographic Characteristics and Health Impacts of High Temperature

Gender	**Frequency**	**Percent**
Male	114	76%

Female	36	24%
Total	150	100%
Age groups **Frequency**	**Percent**	
25-40	105	70%
41-60	24	16%
61-75	21	14%
Total	150	100%
Education **Frequency**	**Percent**	
No formal education	66	44%
Matric	54	36%
Graduate	30	20%
Total	150	100%
Impact on Health **Frequency**	**Percent**	
Blood Pressure	30	20%
Headaches	45	30%
Fatigue	30	20%
Dehydration	35	23%
Heat Rash	10	7%
Total	150	100%

A set of questions were asked to the participants to determine their reactions to high temperatures. It was established that the most common impacts of increasing temperatures in Dera Bugti District were annoyance, worry, and anxiety. Among the 150 participants who did the test, 33% of them said that they felt irritated and impatient and the same percentage identified the presence of stress and anxiety as major effects of exposure to heat. The high temperature was indicating bloated blood pressure in roughly 20 percent out of the respondents mostly senior ones as shown in figure10. Other effects of high heat were sorrow and irritability that had a limited percentage of subjects.

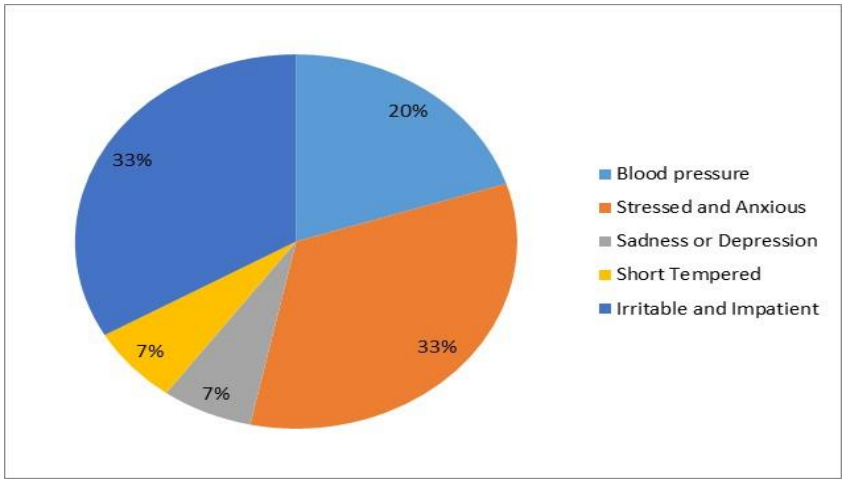

Figure 10: *High temperature impact on study area*

The survey revealed some interesting findings, including how high temperatures affected daily activities because of many health-related issues. According to the results shown in the pie chart below, the most frequently reported problems were the headaches (30%), and the dehydration (23%). The most common symptoms were fatigue and heat rash. Also, nearly 10 percent of the respondents indicated that they have the sensation of dizziness due to high temperatures (Fig. 11)

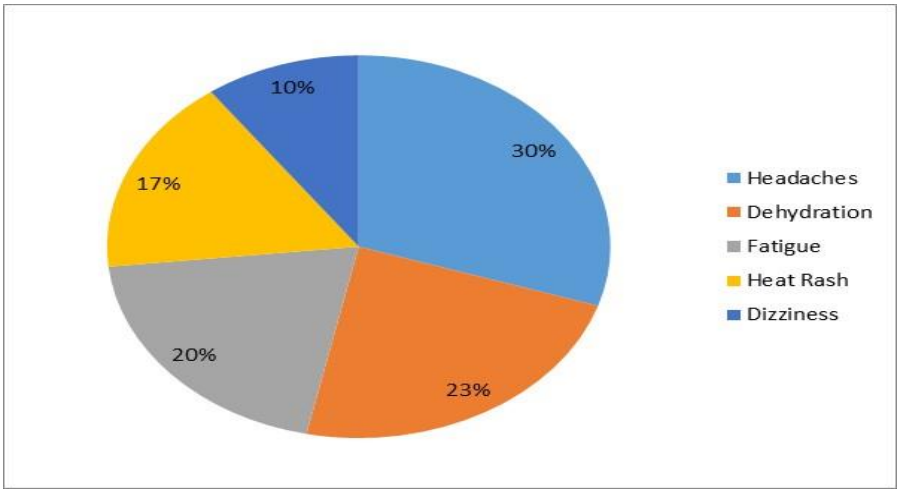

Figure 11: *High temperature and health Problems in Dera Bugti*

It was also found (Fig. 12) that hot weather has effects on mood. Most respondents (47%) stated that they felt anger and frustration whereas 20% said that they felt tired and unmotivated. Also, 13 percent of respondents linked hot weather and anxiety and stress. In addition, 1 in 10 said that they were experiencing discomfort, restlessness and sadness or depression.

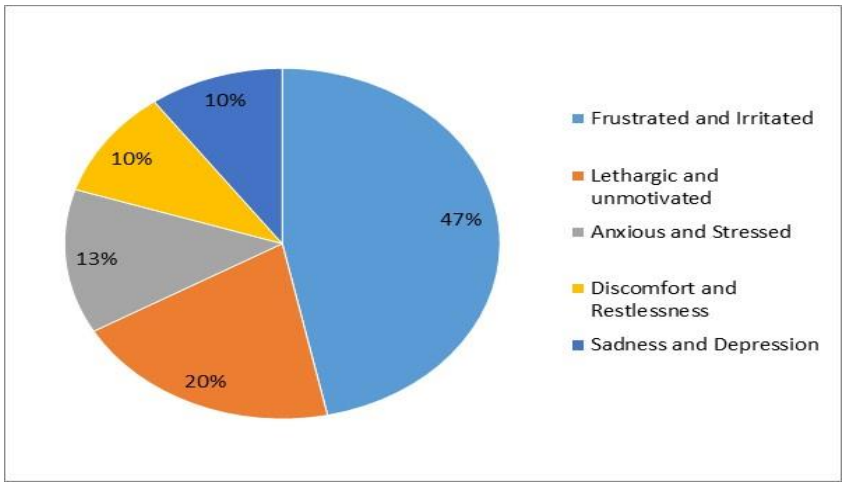

Figure 12: *High Temperature and Mood Changes*

Results on Linear Regression Analysis

To understand the relationship between temperature and human behavior a linear regression analysis was performed in SPSS (Fig.13) The results are quite impressive the red line indicates that average temperatures are always between 23 C and 26 C and there are

significant peaks in 2002 and 2016, which has been a symptom of the continuity of the extreme heat in the area. Laid over this climatic trend are behavioural consequences, with almost half of respondents (47%) noting the overwhelming effect of high temperatures to be anger and frustration, then tiredness and lack of motivation (20%), stress and anxiety (13%), and discomfort or depressive symptoms (10%). This trend is associated with the fact that the long-lasting high-temperature exposure does not just cause physiological stress and provokes serious psychological and emotional disorders but also deteriorates the social welfare and the productivity of the day.

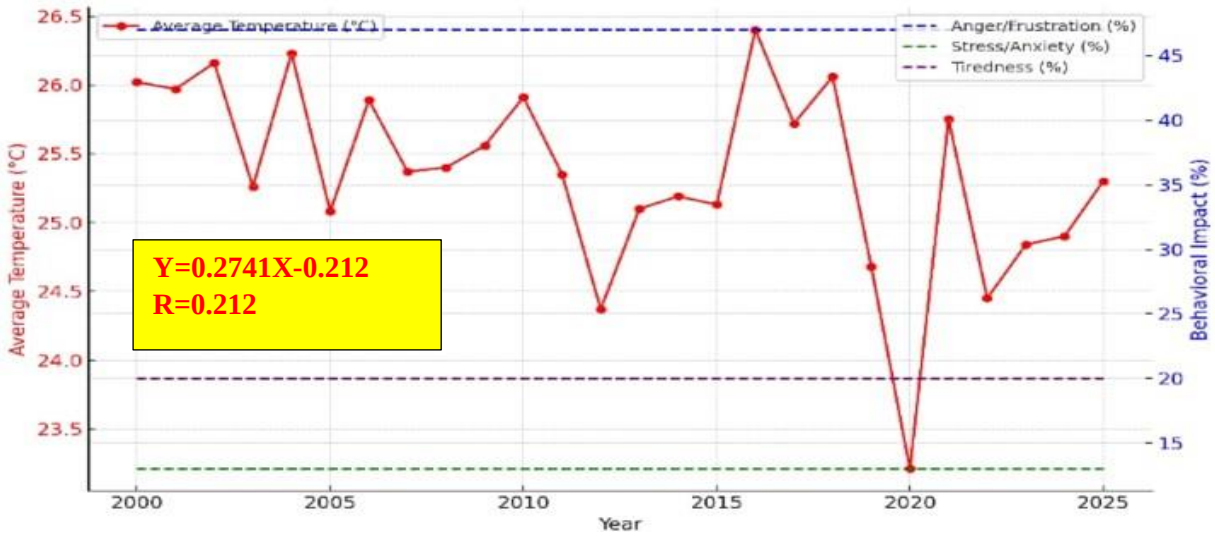

Figure 13: *The Relationship between temperature and Human Behaviour.*

The chart implies the correlation of an average temperature with the behavioral effects in the Dera Bugti District (2000-2025). The average temperature (red line) is fluctuating between 24 0 C and 26.5 0 C. A minor increment in behavioral effect is related to hotter temperatures. The following intermediate correlations are observed: between temperature and anger/frustration there is a positive correlation (R 2 0.21 between temperature and stress/anxiety weak positive correlation (R 2 0.14), and between temperature and tiredness a weak-to-moderate positive correlation (R 2 0.18). Generally, behavioral issues such as anger, stress and tiredness would most probably be increased by an increase in temperature although other elements are also at play.

The results of the current research are in line with the findings of former studies in arid and semi-arid area, which demonstrate that with increased periods of high temperatures, the physical stress, mental exhaustion, and violent intentions are raised. Other studies in South Asia and the Middle East have reported a decline in productivity of work, heat-related illnesses, and psychological distress in extreme temperatures. Nevertheless, the effects experienced in Dera Bugti are seemingly more dramatic by the fact that the adaptive ability is limited, the infrastructure is inadequate, and the place has no cooling systems. This research makes contribution to the body of literature because it presents a spatial demonstration of heat hotspots and attributing long-period trend temperature to behavioural response of human beings in a remote arid district.

Conclusion

To sum up, it is evident in the current study that there is an evident increasing tendency of temperature in the city of Dera Bugti during the 2000 increase and fish in extremities of heat in the area of Sui, Pir Koh and the centre of the district. The spatial analysis supports this point by establishing the fact that central and southern tehsils are starting to be major heat hotspots, which suggests an increased and exposure to climate stress in these regions.

The results also indicate that increased temperatures have a strong connection with many health-related issues, such as headaches, dehydration, fatigue, and changes in blood pressure, as well as apparent behavioural effects, such as anger, stress, anxiety, and decreased motivation. These impacts are especially high on the one-hand outdoor laborers, the aged people and those with low incomes who have little access to cooling stations and health care amenities. The findings thus indicate that it is not only the environmental problem that is emphasized in the high temperatures in Dera Bugti but also the major concern that is posed by the extremely hot climate in public health as well as the socio-economic aspect.

Considering the growth of trends of rising temperatures and concomitant human effects, there is normally an immediate requirement to instil developmental climate adaptation and the general well-being measures of the populace on a local scale. The policy actions, in this case, should involve designing of heat action plans, communal awareness, on heat management, supply of safe drinking water and temporary cooling shelters, and enhancement of health facilities within the high-risk regions. Moreover, to decrease the amount of heat to the identified hotspots, such long-term plans as urban greening, plantation programs, and climate-resistance housing, as well as better access to energy, can be used.

Climate risk implications must be incorporated into the planning and development policies at a district level to mitigate risks accruing in the future besides increasing community resilience. The results of the current study are useful evidences to policymakers, planners, and authorities related to overall health to design specific adaptation policies to arid and climate sensitive states like Dera Bugti.

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