

## **Community Based Climate Change Knowledge: Physical and Mental Health Challenges in Pakistan**

**Sabahat Zareen and Tanvir Akhtar**

Foundation University

The indigenous knowledge and perception, a cognitive dimension of climate change has been a neglected area by researchers in developing countries like Pakistan. Climate change is mostly derived from western culture and studied under different socio-economic, political, and cultural scenarios without considering local factors. In the present study, we focused on exploring the indigenous knowledge of climate change and its precursors in Pakistan. This study was based on a descriptive phenomenological approach. Twenty semi-structured in-depth interviews were conducted with adults aged 31-53 years from Pakistan. Purposive sampling was used to collect data. We used thematic analyses for the interpretation of data. Perception of climate change, human action as a cause of climate change, natural causes of climate change, effects of climate change, effects on natural resources, effects on the physical and mental health, and role and response to the climate change at an individual level were explored through analyses. Population growth, industrialization, and heavy traffic were the causes of climate change, and physical and mental health issues were the major outcomes of climate change. Current study was a comprehensive effort to explore climate change knowledge and related mental health issues among adults in Pakistan. Future studies can use the emerged themes to develop an indigenous measure of knowledge about climate change and its effects on health of individuals. It provided us with the idea to start special efforts for educating the community about climate change and related health conditions. The findings of the study are purely based on the perspectives of the study participants, and this was ensured through data triangulation and an audit trail.

*Keywords.* Climate change, indigenous knowledge, content analysis, mental health

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Sabahat Zareen and Tanvir Akhtar, Department of Psychology, Foundation University Islamabad, Pakistan.

Tanvir Akhtar, is now at National University of Modern Languages, Rawalpindi Campus, Pakistan.

Correspondence concerning this article should be addressed to Sabahat Zareen, Department of Psychology, Foundation University Islamabad, Pakistan.  
Email: [sabahat.he@must.edu.pk](mailto:sabahat.he@must.edu.pk)

Climate change is complex, multidimensional, one of the most pressing issues faced by the planet and its residents. Climate change is defined as persistent changes over time in average temperature, precipitation, sea level, storm, snowfall, extreme weather events like floods and drought (Swim et al., 2009). Developing countries have been more vulnerable to severe climate change effects than most developed countries because of their limited resources and lack of counter measures (Kim & Wolinsky, 2014). Pakistan is the most affected country of South Asia in terms of heatwaves, drought, food safety, and security and health issues due to climate change (Hussain et al., 2018). Due to extreme poverty, physical and financial problems in the country, its capacity to deal with climate change is very low (Abid et al., 2015). People generally consider it a universal and societal issue rather than a personal one. Individuals are living with this reality but cannot experience it directly, that is why their response to this life-threatening issue is very slow (Helgeson et al., 2012). Community based climate change knowledge refers to geo-located information provided by individuals, and it opens new horizons to handle the negative outcomes of climate change through risk awareness about climate change (Lawrance et al., 2022). Current study was based on phenomenological approach as participants were asked to share their knowledge about climate change and its effects on their physical and mental health in the context of community where they were living.

There is a lack of proper attention given by previous research on human dimensions of climate change is evident (Swim et al., 2011). The role of psychologists is very important for climate change as they can help to conceptualize the concept and to better understand all the psychological, psychosocial predictors of this unprecedented issue. To fill this gap, the present study aimed to explore the perceptions of individuals about climate change knowledge, causes and its consequences (especially challenges to physical and mental health).

Both knowledge about causes and impacts of climate change are considered as predictors of climate change risk perception (Linden, 2015). It is necessary to explore psychological aspects of climate change and to get better understanding, knowledge, and perception of individuals about climate change issue (Tobler et al., 2012). Knowledge and response of public is required on pattern of climate change from the area where they are residing for better understanding the effects of climate change on physical and mental health of individuals.

Indigenous climate change knowledge is considered as major cognitive factor of risk perception, but it is still unclear that to what

extent cognitive aspects of climate change can really explain and predict risk perception to the physical and mental health of individuals about climate change due to the difference seen between individual's subjective knowledge about climate change that is, the perception of individuals about it and the actual scientific evidence that exist so far. Most of the times, individuals fail to protect their physical and mental health because of their inability to understand the association between context, climate change knowledge and risk perception (Kellstedt et al., 2008). Another team of researchers observed that indigenous knowledge of the causes and consequences of climate change predicted worry about climate change in give circumstance (Sundblad et al., 2007). Indigenous knowledge and awareness about the cause and impacts of climate change on physical and mental health can enhance the response of individuals to psychological issues like worry, fear, and anxiety.

People within a specific indigenous culture can develop climate change anxiety or physical ailments because of insufficient knowledge about causes and outcomes of climate change (Hayes et al., 2018). Attention must be given to this issue individually as well as at community level to reduce the effect of climate change on mental health (Clayton & Karazsia, 2020). Keeping in view the significant role of climate change in physical and mental health, present study was designed to assess the perceptions of individuals about climate change knowledge (meaning, causes and its outcomes in terms of physical and mental health challenges in the indigenous context of Pakistan. The objective of this study was to collect baseline data on knowledge and perception of individuals about climate change, its causes, and the awareness of prevalence of climate sensitive physical and mental health challenges at community.

## **Method**

### **Study Design**

Present study used the qualitative research method (descriptive phenomenology) to fulfill the desired study objectives like to explore indigenous knowledge and understanding of climate change and understanding of individuals about the physical and mental challenges because of climate change.

### **Sample**

Purposive sampling technique was used for sample of the participants. An inclusion criterion was minimum education level (matric), adults (19-65 Years), and status (family head) and having no

formal education about climate change. The sample consisted of 20 individuals with an age ranged from 31-53 years with 10 of them were men and 10 were women; while, 14 of them have up to 14 years of education (graduation), while 6 of them were post-graduates. Sample size of 20 is based on saturation of data. [Hagaman and Wutich \(2017\)](#) showed that sample sizes of 20 interviews were required to achieve data saturation of meta-themes that cut across research sites. Based on stopping criterion, initially, 10 interviews were conducted and afterwards three more interviews were carried out and continued further till the emerging of new themes or ideas stopped.

### **Instrument**

Data collection instruments for phase I were developed which included informed consent form, demographic sheet and interview guide. The interview guide was prepared after extensive literature review and finalized by committee approach. The committee consisted of four research expert judges with a background of environmental psychology including two Ph.D senior faculty members, one MS faculty member and a Ph.D scholar. Interview guide was evaluated by expert keeping in view of the objectives and research questions of the phase I. Interview guide was prepared to know about general perception, awareness, and knowledge of adults about causes and consequences of climate change on physical and mental health. The major question was asked that “What kind of health difficulties and ups and downs, do you think, is an outcome of climate change?” Questions aimed to explore the respondent’s true knowledge of climate change at that moment. Questions were about human and natural causes of climate change, impacts and major changes in climate on human health during last five years and role of human in climate change. To check the clarity and understanding of questions, pretesting was done by the researcher before going for interview in field. So, the interview guide was used to get information about perception, pattern of understanding and knowledge of adults about climate change and how these changes are threat to physical and mental health at individual and community level. Demographic information of participants was also obtained that was based on personal information of participants such as name, gender, education, marital status, profession, family status, family income, city and residential area (planned, unplanned).

### **Procedure**

Approval from the institutional review committee was sorted before conduct of interviews from participants of the study.

Participants were approached at their respective homes and offices according to their availability for the in person in-depth interviews. Written informed consent was signed by the participant before conduct of the interviews. The average interview time was 40 minutes. Interviews were conducted from May-August 2021 with the purpose of getting information from the respondents about their true knowledge and understanding of the reasons and impacts of climate change on physical and mental health of individuals. Interviews were recorded after getting proper permission from the respondents through a mobile audio recorder. Note taking and observations were done along with recording during interviews.

### **Data Analysis**

All the interviews were transcribed one by one after repeated and careful listening to each statement to dig out the overall contextual meanings. After this process content checking was also done by participants and further help was taken from notes and observation where needed. Repeated careful readings peer checking and expert committee approach was done to check the credibility of the data. We used a qualitative approach to arrive at understanding of climate change related physical and mental health challenges from the perspective of the individuals who are experiencing it. Thematic analysis was used in current study to describe and interpret various aspects of climate change knowledge and physical and mental health challenges due to climate change. This helped us to understand the phenomena of climate change in the context of Pakistan.

The study data was analyzed by using a six-phase data analysis approach introduced by (Braun & Clarke, 2006). It is an approach to identify and analyze qualitative data and generate themes from it. Six steps of the method are as follows: phase I: Familiarizing with the study data Phase II: Generating themes from transcripts Phase III: searching for relevant themes Phase IV: Reviewing the theme Phase V: Defining and naming the theme Phase VI: producing the final report.

### **Results**

As a result of thematic analyses of interviews of indigenous knowledge about climate change among, four main themes (meaning, causes, effects, and response to climate change) emerged. The first main theme “*knowledge about climate change*” was about basic knowledge and perception of people about the term climate change. The second main theme was “*causes of climate change*” which further

consisted of two sub-themes that is; “*human behaviors that lead to climate change*” and “*natural causes of climate change*”. The third main theme was *effects of climate change* as climate change is considered a universal and social issue which has its short-term as well as long-term effects on individuals (physical and mental health), communities, organizations, countries, continents, and on natural resources. The last theme of climate change is “*response to climate change*” consisted of four sub-themes that is “*individual response*”, “*government response*” “*non-government organizations role*” and “*Industrial role*”.

**Table 1**

*Indigenous Themes of Climate Change Knowledge, Causes, Health Effects and Human Response*

Main Theme and (Subthemes)	Initial Codes
Meaning of climate change (temperature, weather, environment, overall change, natural)	Change in temperature, Environmental changes, Climate change and weather change are interlinked, Extreme weather events
Causes of climate change (human behaviors, natural causes)	Deforestation, Pollution, Population Growth, Urbanization, Industrialization, Manipulation of the natural environment, poor planning and management, Environmental Change, Damage to Ozone layer, Global Warming due to increase in carbon dioxide, Weather changes with time, Lack of rains, Natural disasters, Scarcity of Natural Source, Melting Glaciers, Rise in sea level
Effects of climate change (physical and mental health, natural resources, weather changes)	Hypertension, Infectious diseases, Respiratory infections, Allergies, Social Health, Mental Health, Well-being, Water Scarcity, Thinning of Ozone Layer, Pollution, Scarcity of food, destruction of Crops, Rise in sea level, destruction of sea life, deforestation, Severity of weather, (floods, thunderstorm), unpredictable weather changes, change in pattern of seasons, Drought, Lack of rain.
Response to climate change (individual, government, NGO,s Industrial role)	Awareness and education, conscious efforts, pro-environmental action, Technology promotion by Govt, Plantation by Govt. and individual, Education by Govt. Community level efforts, and negative reinforcement approach.

Table 1 describes main themes, sub-themes, and initial codes obtained through analyses of the data. Indigenous knowledge about climate change describes response from the sample of adults on the question consisted of five sub-themes which show the understanding of sample about climate change in general. Most of them understood the term, except few who understood the term climate change as change in weather and temperature, extreme weather events, and overall changes occurring in environment around them. A participant stated that *“Climate change is overall change in our environment due to damage in ozone layer, population, urbanization. Increase in CO2 in air, Smoke and pollution due to our artificial systems all of these factors collectively contribute to increase the temperature of earth and that is all about climate change in my opinion”*.

### **Causes of Climate Change**

Participants explained various causes of climate change according to their perceptions and circumstances. They mainly focus on human actions that are largely responsible for climate change nowadays. As population growth has increased and as a result of it demands and resources are increasing that basically causes climate change. One of the participants explains like *“It is due to excessive use of fossil fuels like coal, oil, and gas. Human activities like deforestation mainly destroy the natural environment around us. It also results in increase CO2 and temperature of this earth”*. Another person expressed that *“climate change is due to increase in traffic, chemicals, smoke and waste material coming out of factories, lack of plantation, excessive use of plastic bags, lack of proper disposal of waste, lack of planning and overpopulation (crowding)”*.

The second sub-theme of the causes of climate change reported by most of the participants is “Natural Causes”. The respondent clearly emphasized changes that most of us often listen through media and climate reports that are not visible but are the main cause of climate change he stated *“ the first and the most important is damage in ozone layer, it’s getting thinner and thinner day by day , then secondly scarcity of water there is misuse of gold water in our society and we are actually finishing our water reservoirs, then melting glaciers due to increase in extreme hot summers with the passage of time”*.

### **Effects of Climate Change**

Climate change is considered as a universal and social issue which has its short-term as well as long-term effects, but people do

not take it as a personal and urgent issue due to its collective nature. People are aware of the phenomena, but they are confused about what action they can take individually and most of the mitigation actions they are expecting to be taken by government. There are three sub-themes of the main theme of “effects of climate change” include “individual Health and well-being”, “natural resources” effect on weather changes”.

### **Physical and Mental Health Challenges**

Climate change has both physical and mental health effects, as with extreme weather events like floods, extreme hot summers vulnerable population is affected more as compared to privileged as they can't afford even proper shelters and other resources needed. It creates uncertainty about the future, anxiety, and distress. Our participants also expressed how exposure to natural disasters and extreme weather events can lead to disturbance of daily life activities, loss of possessions and other mental health issues. According to participants of the study, physical as well as mental health is affected due to climate change issue and this is all because of our excessive use of mechanical systems. *“yes, we are effected from climate and weather changes especially during extreme hot and extreme cold days we get ill, smug issue is very prevalent in our environment which affect human lungs and produce respiratory infections, often suffered from flu, cough during changing season”*

### **Natural Resources**

One of the major effects of climate change worldwide is scarcity of natural resources due to which other things are affected. Population growth is the major cause of scarcity of natural resources as we consume our resources more rapidly without thinking about making some alternatives for it. One of the participant emphasized *“Temperature of earth is continuously increasing from last five years as result glaciers are melting, sea level rise and we have to face scarcity of water..... extreme weather and heavy rain fall effect crops very badly as there is lack of proper infrastructure in rural areas of our country”*.

### **Weather Changes**

The main sub-theme of “effects of climate change” is change in weather. Almost all participants stated that drastic change has been observed in weather and its pattern. Increase in severity of summers and winters along with unexpected episodes of extreme weather



events (floods, thunderstorm) are also reported in last five years. One of the participants reported that” *Previously the patterns of weather such as Monsoon was totally different now it has become prolonged and mass destruction occurs because of floods. Duration of summer has increased, and timing of Spring and Autumn has reduced*”.

### **Response to Climate Change**

The last theme of climate change is “response to climate change” consisted of four sub-themes: “individual response”, Government response” Non-Government Organizations role” and “Industrial Role”. Research participants explained the possible role or response on individual level. What part can an individual play in climate change: “*As a human we are actually playing both positive as well as negative role in climate change .....very less we are doing in our individual capacities, in negative side, I think we are not careful about where we dispose our waste and garbage, how fearlessly we are using our precious resources like water, how many plantations we are doing. We can play a positive role by taking care of our environment, by using proper well-maintained vehicles and by using quality fuel*”.

### **Governmental Role**

Most of the respondents identified the role that government is playing already and further suggested that how much more governmental bodies can do for the betterment of our environment: “*Government is playing his role very well on its level, for example, million tree Tsunami project by the government is appreciable, however, its effect can be seen after five years. Other than that, Govt should work on some planning for proper disposal of waste it should be out of cities*”. Similarly, one participant suggested that “*Government needs to make teams and start campaigns to control environmental pollution which may include; plantation, stop using plastic bags, population growth, transportation, take out waste from residential areas, transfer of factories from cites to side areas, improvement in the sewage system, installation of water filter plants, and consumption of quality fuel*’.

### **Role of Non-Governmental Organizations**

NGOs can play a very import“ Government the betterment of society and are already doing well, most of the study participants highlighted their role and one of them gave suggestions that “*Government and NGO,s collaborate to initiate community-level programs to spread awareness about climate change in common*

*people of the country because they do not have much information about the issue as compared to educated people which are very less and will not make difference ..... They should specifically educate them on how to dispose of the waste by repairing, reusing, and recycling the products”.*

### **Role of Industries**

Like community programs and individual roles, the industry needs to play its role. The stakeholders from industries and the government should seriously think about climate change and do planning as soon as possible. Many participants suggested their role to play “*make strict rules to dispose of the huge waste of factories properly, shift them from residential areas as it pollutes the whole environment and uses new technology that can reduce the carbon emissions and produce less harmful gases.....or industrialists should take part in activities that can reduce the negative effect of industries on the environment e.g.; plantation, implementation of new eco-friendly technologies, install treatment plants in factories and make them functional along with proper disposal of waste material”.*

**Table 2**

*Major Themes of Community Based Climate Change Knowledge*

<b>Nature Element</b>			
Causes of Climate Change	of	Climate	Increase in temperature on earth
			Natural Process
			Due to increase in CO <sub>2</sub>
			Emission of Green Gases through Ozone layer
			Weather changes
			Natural disasters
Outcomes of Climate Change	of	Climate	Unexpected Weather Changes
			Decrease in natural resources
			Increased sea level
			Drought in some regions
			Severe weather changes
			Decrease in glaciers
<b>Human Element</b>			
Causes of Climate Change			Humans are responsible
			Decrease in forests
			Increased population
			Increase urbanization
			Increased Pollution (Industrial, Air, Earth)
			Poor Administration and lack of planning

*Continued...*

<b>Nature Element</b>	
Effects of Climate Changes	Poor religious affiliation Developed countries are responsible Negative Health effects (Physical, Social and Mental Health) Challenges to human support and wellbeing Scarcity of food and basic needs Education and Awareness Campaigns Pro-environmental Behaviors
Efforts to Overcome side effects of Climate change	Use of technology Following religious rules and education Conscious efforts at individual level Role of the government and non-government institutes

Themes in [Table 2](#) further described the causes and outcomes of climate change, which has two categories; climate change caused by a human behavior and effects of climate change on individuals; and natural causes of climate change and effects of climate change on natural resources. In Human actions, include excessive use of fossil fuels, urbanization, deforestation, industrialization, and population growth are the most vulnerable and threatening factors of climate change in Pakistan. Moreover, climate change has serious consequences for physical as well as mental health of individuals.

## Discussion

Climate change is a global phenomenon and individuals do not perceive it as a personal threat. The purpose of this research was to know how well people of our country understand this issue. Current study focused on indigenous knowledge of climate change. The findings indicated that respondents perceive climate change in terms of overall change in temperature and weather in their environment, like extremely hot and extremely cold weather. These findings are clearly in line with previous findings that individuals in Pakistan, understands climate change in terms of severity and frequency of extreme weather events due to climate change ([Ali et al., 2019](#)).

Results of the present study indicated the indigenous causes of climate change, which are categorized into; natural causes and human actions leading to climate change. Inhuman actions, the use of fossil fuels, urbanization, deforestation, industrialization, and population growth are the most vulnerable and threatening factors of climate change in Pakistan. Whereas scarcity of resources, damage in the ozone layer, and rise in temperature are considered highly responsible

natural factors for climate change that is also in line with a study done in Egypt (Elshirbiny & Abrahamse, 2020). The reason behind this is the lack of planning and poor implantations of laws against the use of low-quality fuel and other products that adds to environmental pollution.

Usually, individuals knew and heard about climate change through media, news, and social media. People from all walks of life are somehow affected by climate change, however, people react to it differently depending upon their personal experiences in given circumstances. Climate change has different effects on the physical and mental health of individuals. Due to changing pattern of average temperature throughout the country, many infectious diseases like; Vector-Borne and water Borne diseases have become so common and fatal in the last few years and these are an indirect effect of climate change. These findings are well supported by the study in Hindu Kush Himalayan region (Dhimal et al., 2021).

On the other hand, climate change also affects mental health and individuals face depression, anxiety, low mood, and post-traumatic stress disorder due to the experiences of extreme weather events like heat stroke, floods, and drought are also evident (Hayes et al., 2019). Present study findings also highlighted the fact how mental health is affected by climate change. Similarly, major climate change consequences reported by most of the respondents are scarcity of natural resources such as water, deforestation and many food items, destruction of the ozone layer, melting glaciers, and rise in sea level. These findings are broadly in line with the previous studies (Capstick et al., 2015). According to the World Health Organization, about 250,000 deaths are expected due to health-related issues because of climate change from 2030 to 2050 (Hayes et al., 2018). To develop a sustainable climate change policy and to take proper action on it is very important to know the perspective of local people on this phenomenon. Public perception of climate change is poor and individuals were unable to relate it with the physical and mental health issues in Pakistan because of the lack of a proper education system and awareness about climate change and its effects on human health.

## **Conclusion**

Understanding of people about climate change and related health challenges determines how well they respond to it. Individual-level efforts are needed to tackle this issue. Studies show that the responses of individuals vary with their education level and economic condition. Higher education and socio-economic status give them good control

over the situation (Hayes et al., 2019). These findings are in line with the findings of the present study. All these issues need to be addressed by the authorities and responsible citizens of the country. It was found that all participants appreciated the acts that the government has already taken to reduce the harmful effects of climate change on physical and mental health and suggested further important and timely steps such as awareness programs at the community level, team building for different projects like plantation, proper disposal of waste and implementation of new advance technologies to reduce the carbon emissions and healthy behaviors for self-care.

### **Limitations and Suggestions**

The findings of this study are context specific based on the perceptions and experiences of individuals living in Lahore, Islamabad, and Rawalpindi. Further, the study included a small sample and included only the individuals with adequate time and interest in the study. Findings of the study about the effects of climate change on mental and physical health are specific to the context but these findings may be transferable to other similar contexts. Future researchers must consider the fact that climate change has different consequences on physical and mental health of individuals in each country, but climate change is result of global deterioration. Researchers must bear in mind that unique circumstance and context of each place has its own dynamics and individuals' capacity to deal with climate related health hazards varies between regions and nations due to different contexts and systematic vulnerabilities.

### **Implications**

Understating of climate change related physical and mental health issues is one of the great challenges for our society. The consequences of climate change on individuals' physical and psychological health are a concern for psychologists and researchers. Rising temperatures, heat waves, floods, droughts, fires, loss of forest, and melting glaciers, along with disappearance of rivers and desertification, can directly and indirectly cause human pathologies that are physical and mental. The themes found in this study can be used to develop measures of perceptions about climate change and its effects on health in indigenous context of Pakistan. There is a need to conduct more studies to see the link between climate change and physical as well as mental health issues.

## References

- Abid, M., Scheffran, J., Schneider, U. A., & Ashfaq, M. (2015). Farmers' perceptions of and adaptation strategies to climate change and their determinants: The case of Punjab province, Pakistan. *Earth System Dynamics*, 6(1), 225-243.
- Ali, M. F., Ashfaq, M., Hassan, S., & Ullah, R. (2019). Assessing indigenous knowledge through farmers' perception and adaptation to climate change in Pakistan. *Polish Journal of Environmental Studies*, 29(1), 525-532.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.
- Capstick, S. B., Demski, C. C., Sposato, R. G., Pidgeon, N. F., Spence, A. & Corner, A. (2015). Public perceptions of climate change in Britain following the winter 2013/2014 flooding. *Understanding risk research group working* (pp. 15-01), Cardiff University, Cardiff, UK.
- Clayton, S., & Karazsia, B. T. (2020). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology*, 69(6), 1014-1034.
- Dhimal, M., Bhandari, D., Dhimal, M. L., Kafle, N., Pyakurel, P., Mahotra, N., ... Groneberg, D. A. (2021). Impact of climate change on health and well-being of people in Hindu-Kush-Himalayan region: A review. *Frontiers in Physiology*, 12, 651189.
- Elshirbiny, H., & Abrahamse, W. (2020). Public risk perception of climate change in Egypt: A mixed methods study of predictors and implications. *Journal of Environmental Studies and Sciences*, 10(1), 242-254.
- Lawrance, E. L., R. T., Jessica N. L. V., Lisa P., & Neil J. (2022). The Impact of climate change on mental health and emotional wellbeing: A narrative review of current evidence, and its implications. *International Review of Psychiatry*, 34(5), 443-498, [doi.10.1080/09540261.2022.2128725](https://doi.org/10.1080/09540261.2022.2128725)
- Hagaman, A. K., & Wutich, A. (2017). How many interviews are enough to identify meta themes in multisided and cross-cultural research? Another perspective on guest, bunce, and Johnson's (2006) landmark study. *Field Methods*, 29(1), 23-41.
- Hayes, K., Berry, P., & Ebi, K. L. (2019). Factors influencing the mental health consequences of climate change in Canada. *International Journal of Environmental Research and Public Health*, 16(9), 1583-1590.
- Hayes, K., Blashki, G., Wiseman, J., Burke, S., & Reifels, L. (2018). Climate change and mental health: Risks, impacts and priority actions. *International Journal of Mental Health Systems*, 12(1), 1-12.
- Helgeson, J., van der Linden, S., & Chabay, I. (2012). The role of knowledge, learning and mental models in public perceptions of climate change related risks. *Learning for Sustainability in Times of Accelerating Change*, 12(2), 329-346.

- Hussain, M., Liu, G., Yousaf, B., Ahmed, R., Uzma, F., Ali, M. U., ... Butt, A. R. (2018). Regional and sectoral assessment on climate-change in Pakistan: Social norms and indigenous perceptions on climate-change adaptation and mitigation in relation to global context. *Journal of Cleaner Production*, 200(6), 791-808.
- Kellstedt, P. M., Zahran, S., & Vedlitz, A. (2008). Personal efficacy, the information environment, and attitudes toward global warming and climate change in the United States. *Risk Analysis: An International Journal*, 28(1), 113-126.
- Kim, S. Y., & Wolinsky N, Y. (2014). Cross-national public opinion on climate change: The effects of affluence and vulnerability. *Global Environmental Politics*, 14(1), 79-106.
- Linden, V. S. (2015). The social-psychological determinants of climate change risk perceptions: Towards a comprehensive model. *Journal of Environmental Psychology*, 41(1), 112-124.
- Sundblad, E. L., Biel, A., & Gärling, T. (2007). Cognitive and affective risk judgements related to climate change. *Journal of Environmental Psychology*, 27(2), 97-106.
- Swim, J. K., Stern, P. C., Doherty, T. J., Clayton, S., Reser, J. P., Weber, E. U., ... Howard, G. S. (2011). Psychology's contributions to understanding and addressing global climate change. *American psychologist*, 66(4), 241-250
- Swim, J. K., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., ... Weber, E. (2009). *Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges*. A report by the American Psychological Association's task force on the interface between psychology and global climate change. American Psychological Association, Washington, USA.
- Tobler, C., Visschers, V. H. M., & Siegrist, M. (2012). Addressing climate change: Determinants of consumers' willingness to act and to support policy measures. *Journal of Environmental Psychology*, 32(3), 197-207.

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