Spectrum of Engineering Sciences
ISSN (e) 3007-3138 (p) 3007-312X Volume 4, Issue 1, 2026

CLIMATE CHANGE AS AN EMERGING DETERMINANT OF MENTAL HEALTH: EVIDENCE, CHALLENGES, AND POLICY IMPLICATIONS

Shahid Mahmood[*1], Razia Iqbal[*2], Rimsha Aslam [3], Tehreem Zafar [4], Bareera Amjad Iqbal Ahmad [5], Noor-ul-Ain[6]

[*1,*2, 3,4,5,6] *Department of Zoology, University of Gujrat, Gujrat 50700, Pakistan*

[*1]shahid.mahmood@uog.edu.pk, [2]razia.iqbal@uog.edu.pk

DOI: http://doi.org/10.5281/zenodo.20265583

Keywords
Mental health, Climate change, Heat waves, Eco-anxiety, displacement, Vulnerability, Resilience, food insecurity.

Article History
Received: 16 November 2025
Accepted: 25 December 2025
Published: 13 January 2026

Corresponding Author: *
Shahid Mahmood,
Razia Iqbal

Abstract

Mental health is substantially impacted by climate change, which has immediate, indirect, and long-term effects. The present data on the connection between exposures associated with climate change and psychological consequences are compiled in this review. Heatwaves, floods, wildfires, and droughts are examples of extreme weather phenomena that are regularly linked to higher risks of depression, anxiety, Post-Traumatic Stress Disorder, substance abuse, and suicide. Increased psychiatric hospital admissions and exacerbation of pre-existing mental problems are also associated with rising temperatures and extended exposure to heat. Psychological suffering is worsened by indirect pathways. Food insecurity brought on by climate change, livelihood disruption, forced migration, and social instability all raise stress levels and impair coping skills, especially in low-resource and climate-vulnerable environments. Beyond trauma associated with disasters, recent findings reveal persistent and anticipatory stressors, including climate-related worry and ecological grief that are more frequently reported in children and young adults. The effect of climate crises on mental health is unevenly distributed. Particularly vulnerable are women, low-income groups, rural areas, displaced people, and those with a history of mental illness. However, psychological outcomes can be mitigated by resilience characteristics like social cohesiveness, adaptive infrastructure, community-based treatments, and climate-informed mental health services. Despite growing research, there are still significant gaps, such as the lack of long-term studies and the under-representation of low- and middle-income nations. To address the increasing psychological effects of climate change, multidisciplinary research must be strengthened, and mental health must be incorporated into programs for adaptation and mitigation.

INTRODUCTION

Climate change is a major worldwide hazard to both mankind and natural ecosystems (Yang et al., 2025). Sea level elevation, rising global temperatures, and increased hydrologic cycle variability, such as extreme droughts and heavy rainfall, are all caused by rising greenhouse gas concentrations. For this reason, climate change is commonly described as an earth system problem (Limaye, 2021). Climate conditions are anticipated to grow more intense and volatile at current emission rates, with major consequences for both human and natural systems (Major-Smith et al., 2025). In recent years, intensifying heatwaves, prolonged droughts, wildfires, storms, and floods have all been connected to human-induced warming (Lawrance et al., 2022;

Obradovich et al., 2018; Daraz et al., 2024; Mitchell, Maheen, & Bowen, 2024).

Even though climate change is a worldwide occurrence, its effects are experienced individually and locally. The impact on human health, migratory patterns, food security, livelihoods, and biodiversity is intensifying (Trummer et al., 2023). Since high heat has long been known to have detrimental impacts on physical health, several nations have implemented precautionary health policies for particularly vulnerable populations (Chukwusa et al., 2025).

On the contrary, the effects of climate change on mental soundness have historically received significantly less emphasis (Charlson et al., 2022; Pardon et al., 2024; Casson et al., 2023). Prior to 2020, mental health was identified in less than 1% of over 54,000 articles on climate change (Chukwusa et al., 2025), and in 2017, health-focused research accounted for only 1% of all climate change studies (Limaye, 2021). Despite a rise in systematic reviews and policy briefs on mental well-being in recent years (Soomro et al., 2024), broad-scale risk quantification of mental health associated with climate crises is still scarce (Obradovich et al., 2018).

Natural disasters, extreme weather, and slow damage to the environment are climatic stressors having an impact on mental health both directly and indirectly (Amnuaylojaroen & Parasin, 2025). Heat and drought are associated with high rates of psychiatric hospital visits and an increased risk of suicide during hotter times, while hurricane and flood exposure has been empirically linked to Post-Traumatic Stress Disorder (PTSD) and severe depression (Obradovich et al., 2018; Soomro et al., 2024). Furthermore, recent findings demonstrate that weather fluctuation affects sleep, emotion control, and cognitive function (Obradovich et al., 2018). Although the physiological effects of extreme heat are widely recognized, its significant cognitive impact remains largely unexplored (Chukwusa et al., 2025).

Mental health diseases are one of the primary contributors to disability in the world today. Their worldwide load has risen considerably in recent decades (Larasati et al., 2026). About 13% of all diseases worldwide are caused by mental disorders, with depression being the leading cause of nonfatal health losses (Hua et al., 2023). Substance misuse, depression, and anxiety substantially increase Disability-Adjusted Life Years (DALYs), lower productivity, raise healthcare expenses, and are associated with chronic illness and early death (Amnuaylojaroen & Parasin, 2025). Therefore, determining the factors that contribute to mental diseases is crucial for efficient prevention, treatment, and general population health improvement (Hua et al., 2023).

A general explanation for mental health is a condition of comfort in which people are able to recognize their capability, work well, give back to their communities, and manage everyday stressors (Bryan et al., 2020). Psychological discomfort, psychiatric symptoms, hospitalizations, self-harm, solastalgia, ecological grieving, mortality, suicide, climate anxiety, and general social and emotional well-being are included in modern frameworks that expand this term (Charlson et al., 2022). Climate change is expected to worsen pre-existing risk factors for mental illnesses by upsetting economic, environmental, and social structures (Obradovich et al., 2018).

Certain groups are at disproportionate danger. Children in Pakistan and around the world are already experiencing negative impacts of climate imbalance that are expected to get worse (Soomro et al., 2024). Shifting climate patterns in Africa, where many populations rely on agriculture and cattle, raise the risk of disease transmission, encourage migration, and intensify psychosocial stress (Trummer et al., 2023). Climate disasters can cause uncertainty, loss, and disruption, which can lead to depression, anxiety, and chronic psychological suffering. Furthermore, public concern over climate change has persisted despite times of diminished media coverage, suggesting cumulative psychological impacts from compound stressors (Lawrance et al., 2022).

The environmental aspect of mental balance is currently being recognized, particularly in climate-sensitive regions like Southeast Asia (Amnuaylojaroen & Parasin, 2025). Concurrently, research on this topic is expanding rapidly. Extensive empirical research and machine learning techniques are being used to evaluate the risks associated with both long-term warming trends and acute extreme

occurrences (Obradovich et al., 2018; Pardon et al., 2024; Amnuaylojaroen & Parasin, 2025). Newly developed psychometric instruments, such as the Climate Change Anxiety Scale (CCAS), are being validated in various cultural contexts, including the United States, Japan, India, China, and Hong Kong, as climate-related psychological research gains traction (Tam et al., 2023; Lau et al., 2025).

Public support and policy discourse are influenced by public perception, which is crucial in forming mitigation and adaptation activities (Yang et al., 2025). By defining climate change with regard to human health, one may increase involvement with decision-makers and make risks tangible (Limaye, 2021). The WHO has demanded thorough evaluations of connections between climate change and well-being, including exposure-response analyses, estimates of present and future health burdens, and enhanced risk communication (Charlson et al., 2022).

Few nations substantially increased their pledges to the Paris Agreement, which called for them to offer strengthened Nationally Determined Contributions (NDCs) in 2020. Additionally, the implementation of health-related components has been hindered by a lack of funding and cross-sectoral coordination. Despite increasing awareness, studies on how health experts perceive the effects of climate change are still scarce, and they are primarily focused on English-speaking nations like the US (Kotcher et al., 2021). Therefore, it is important to advance multidisciplinary research, enhance policy integration, and increase global representation in studies related to mental health and climate.

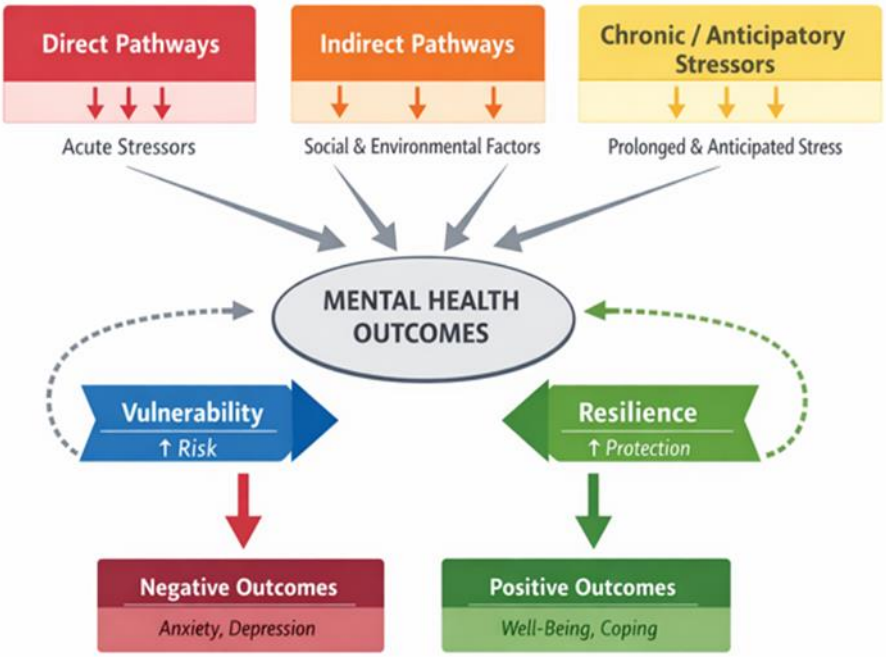

Figure 01: Conceptual framework diagram of mental health outcomes

Direct pathways

Over the past 20 years, the association between climate change and mental health has grown as a major public health concern. Beyond the effects on physical health, research is now looking at the indirect, direct, and long-term routes via which stressors associated with climate change affect psychological well-being. Collectively, evidence points to climate change as a problem for emotional well-being and environmental disaster (Limaye, 2021; Obradovich et al., 2018).

The timeline and intensity of severe natural disasters, including cyclones/hurricanes, floods, heatwaves, wildfires, and droughts, are rising because of rising global temperatures. These catastrophes have consistently been related to increased psychological distress, anxiety, depression, PTSD, rage, sleep disorders, and hostility (Cowlishaw et al., 2023; Wertis et al.,

2023; Costin, Fisher, Harper, Nahhas, & Sullenbarger, 2024).

The aforementioned system is evidenced by the case of the California wildfires. In 2018, people who were subjected to the state's worst fire ever recorded, the California Camp Fire, reported severe manifestations of anxiety, despair, and PTSD the following year. This has been termed "climate trauma," which entails the psychological and cognitive consequences that persist beyond the initial tragedy (Nan et al., 2025). Likewise, during Canada's historic wildfire season of 2023, up to one-third of those exposed reached thresholds for probable severe depression, PTSD, and Generalized Anxiety Disorder (GAD) after former wildfire exposure, with symptoms lasting for years and, in certain situations, up to ten years (Obuobi-Donkor et al., 2024).

Figure 02: Stress timeline leading to mental disorder

The effects of flooding disasters are comparable. Significant psychological care demands and widespread rates of depression, anxiety, and PTSD have been linked to major floods in Pakistan, Iran, and Brazil as well as the 2010–11 Queensland floods and cyclones in Australia (Das et al., 2025; Costin, Fisher, Harper, Nahhas, & Sullenbarger, 2024; Shabani et al., 2024; Diefenthaeler et al., 2025). Similarly, the effect on mental health is increased by forced relocation following catastrophes. People who had to move to "red zones" after the 2011 Christchurch earthquake had higher rates of treatment for moderate mental health conditions than those who stayed, and the effects lasted for years, especially for older adults (Hoang et al., 2025).

Impacts from various disaster types can manifest as acute stress reactions or develop into long-term mental health issues. Psychological effects can last for years following exposure, according to longitudinal studies from Australia and the UK (Diefenthaeler et al., 2025; Luong et al., 2021). According to studies on wildfire survivors, the prevalence of sadness (~25%), anxiety (~18%), and PTSD (~14%) is about one month, and high-impact groups continue to have higher symptoms over time (Obuobi-Donkor et al., 2024). After Hurricane Ida, crisis text data revealed significant spikes in help-seeking for anxiety, stress, suicidal thoughts, and bereavement in the weeks to months after landfall, indicating a severe psychological need in impacted communities (Wertis et al., 2023).

Crucially, concurrent crises might mask mental health indicators rather than indicate a lack of influence. For instance, several analyses conducted during the COVID-19 period did not find any further short-term boost in juvenile crisis texts following wildfires. This is probably because the pandemic has already increased the level of crisis service use as a baseline. This example shows how multiple disasters can either exacerbate or mask psychological effects (Sugg et

al., 2022). Heat is another significant link between psychological pain and climate change. People with pre-existent mental illnesses are especially vulnerable to the physiological and cognitive strains brought on by high temperatures, especially those with conditions like schizophrenia that affect thermoregulation. According to research, hospitalization for behavioral and emotional illnesses elevates substantially during periods of severe heat (Amnuaylojaroen & Parasin, 2025).

These conclusions are supported by recent epidemiological investigations. Scorching heat was associated with increased visits to emergency rooms for mental illnesses in the US between 2010 and 2019, suggesting that heat can significantly worsen mental illnesses and raise service demand (Nori-Sarma et al., 2022). Additionally, population-level research conducted in Shanghai from 2008 to 2021 showed that heatwaves' duration and intensity both markedly raised the death rate from mental illnesses (Tao et al., 2025).

Extreme heat and catastrophe exposure increase psychological stress at the population level. According to research, disasters like Hurricane Katrina were associated with a four percent increase in psychological disorders in the impacted communities. Extreme heat, persistent drought, and severe storms all indirectly increase mental distress through associated risks like air pollution, flooding, injuries, infrastructure destruction, and displacement (Obradovich et al., 2018; Limaye, 2021).

Growing evidence suggests that trauma associated with climate change impacts both emotional and cognitive health. One year after the Camp Fire, direct exposure to wildfire was linked to quantifiable decision-making impairments and changed brain activity. Individuals displayed inappropriate activity in the parietal and posterior limbic regions as well as decreased optimal decision-making, indicating that rumination or ongoing traumatic stress may impede adaptive cognitive processes (Nan et al., 2025). These findings confirm the concept of "climate trauma," which includes persistent mental symptoms, cognitive impairment, and a reduced capacity to make future plans after climatic disasters (Cowlishaw et al., 2023; Nan et al., 2025).

Long-term climate changes affect mental well-being in addition to immediate calamities. A two percentage point rise in the spread of mental health disorders has been linked to a long-term 1°C rise in extreme temperatures, indicating that slow warming can quietly alter psychological patterns at the population level. Over the past ten years, research has repeatedly shown that greater temperatures and more precipitation are associated with an elevated level of psychological discomfort (Obradovich et al., 2018). Communities that frequently face climate-related disasters are frequently located in areas with a lack of medical experts and already have restricted access to mental health services. Because prolonged disaster exposure and inadequate treatment access combine to create a persistent psychological load, this structural vulnerability exacerbates inequality (Cowlishaw et al., 2023; Wertis et al., 2023).

Indirect pathways

Destruction of livelihoods is one of the main indirect paths, especially in populations that depend on agriculture. Farmers whose income and food security are directly dependent on water availability and land productivity suffer greatly from drought-related agricultural losses in nations like Australia and Iran (Luong et al., 2021; Tahernejad et al., 2025). Droughts, floods, and environmental shocks brought on by climate change further threaten agricultural systems, particularly in low-resource, rain-fed, and humanitarian areas. In vulnerable settings like African refugee settlements, where climate extremes threaten already vulnerable food systems, the ensuing food insecurity and poverty generate a cycle of material deprivation and declining mental balance (Hall et al., 2025).

This association is justified by empirical research. Even after accounting for differences in wealth, household food and water shortage was separately linked to poorer mental health and increased odds of likely depression among smallholder farmers in Kenya who were HIV positive (Joshua D. Miller et al., 2021). Furthermore, livelihood-focused agricultural interventions enhance psychological outcomes by lowering stress, anxiety, depressive symptoms, and rumination while bolstering optimism and agency, according to qualitative research conducted in Kenya (Hatcher et al., 2020).

Other contexts exhibit comparable trends. Concurrent food and water insecurity during a volcano eruption in Tonga was linked to higher levels of mental anguish (Bethancourt et al., 2025). Furthermore, the psychological effects of abrupt income drop brought on by job loss owing to climate change are more severe than those of income variations among higher-income groups, underscoring the disproportionate burden placed on economically vulnerable people (Zeng et al., 2025).

The impacts of the economic shock on psychological health can be seen by the similar effects that have been observed with other non-climate shocks. In rural Bangladesh, while under quarantine caused by the pandemic COVID-19, the reduction in income and food insecurity has seen significant increases in anxiety and depression among mothers, showing the effects that lack of resources and economic shocks can have on mental health, similar to those observed with climate shocks (Hamadani et al., 2020).

Another way in which the confluence of economic instability and environmental degradation is reflected is through forced displacement. For example, internal displacement in Bangladesh caused by riverbank erosion and displacement from Venezuela to Peru are two cases of displacement caused by climate-related stressors, which were linked to increased depression and anxiety (Carroll et al., 2020; Kaiser, 2023). When the impacts of ecological breakdown, such as riverbank erosion and floods, are too intense and irreversible, they often cause permanent displacement of families (Freihardt, 2025). Poverty, social exclusion, and erosion of social roles are significant socioeconomic factors in the psychological resilience of displaced communities, and these displacements are closely related to these factors. In addition, displacement caused by climate change is often accompanied by limited service availability and structural challenges. Post-migration stressors such as unemployment, discrimination, language barriers, and limited healthcare are significant contributors to depression and anxiety in refugees who have been forcibly displaced (Goodkind et al., 2020; Hall et al., 2025).

Research indicates that specific initiatives for social and economic integration can lessen these impacts. A multilevel intervention that improved social connectivity among displaced populations and strengthened social support networks, language proficiency, and access to community resources dramatically decreased symptoms of anxiety and sadness. Significantly, these benefits in mental health were partially mediated by social integration, indicating the protective function of community-level support (Goodkind et al., 2020). Climate change raises healthcare requirements while decreasing access to services, according to expert assessments from African contexts. Many times, psychological disorders associated with migration brought on by climate change go undetected and untreated. Particularly in unsafe settings when mental, sexual, and reproductive health decline, women and girls are disproportionately impacted. Case studies from Zimbabwe and Sudan show how gendered vulnerabilities already present are exacerbated by displacement driven by environmental changes (Trummer et al., 2023).

Broad transformation of climate can also have a negative impact on mental health. Climate change contributes to ecological and economic instability through a number of interconnected mechanisms. While rising temperatures promote ground-level ozone and increase the geographic spread of vector-borne diseases such as West Nile virus and Lyme disease, warmer ocean temperatures intensify coastal storms. Affected communities have increased cumulative stress as a result of these cascading environmental changes (Limaye, 2021).

Disruptions brought on by climate change also cause social and political structures to become more unstable. Agriculture, trade, and movement are disrupted by droughts, floods, changing water levels, and altered weather patterns. These disturbances increase susceptibility to psychological discomfort by creating economic instability and disrupting social support networks (Trummer et al., 2023; Amnuaylojaroen & Parasin, 2025).

Following floods and storms, infrastructure damage contributes to the resulting effects by interfering with housing, healthcare services, and public areas that often promote social cohesiveness. Family strife, social isolation, and limited access to healthcare are all on the rise following disasters, according to data from

communities devastated by flooding (Kaiser, 2023; Shabani et al., 2024).

A striking example of the above link can be seen in the research carried out in Nepal. Higher levels of PTSD and depression were linked to poorer disaster preparedness and less social cohesiveness in communities devastated by earthquakes. Benefits to mental health were partially mediated by increases in social connectivity, and a hybrid intervention that combined preparedness training and mental health support decreased symptoms while enhancing cohesiveness (Mitchell et al., 2024).

In a comparable manner, women in Pakistan reported higher levels of psychological and financial stress after significant flooding. Nonetheless, there was a strong correlation between reduced levels of depression, anxiety, and stress and optimal social support, confirming the protective function of social networks in communities exposed to climate change (Das et al., 2025).

The interdependence of migration, health, and climate change is further highlighted by evidence from expert discussions. Climate crises increase forced migration, raise medical care costs, and limit access to services, according to professionals who engage with migrant communities. Very often, mental health issues among displaced people go undetected and untreated. Africa's experiences demonstrate how urgently these intertwining issues require integrated research, policy involvement, and cross-sector cooperation (Trummer et al., 2023).

Chronic and Anticipatory Stressors

Eco-anxiety, widely explained as persistent worry of a natural disaster and increased emotional, cognitive, or physical suffering in reaction to perceived climate risks or environmental loss, is being documented in a growing number of studies. Children and young adults seem to be particularly susceptible to the symptoms, which include panic episodes, helplessness, irritability, rage, melancholy, sleep difficulties, and functional impairment (Major-Smith et al., 2025; Cosh et al., 2025; Benoit et al., 2025; Von Gal et al., 2024). Several global studies demonstrate that adolescents are generally concerned for the climate. Most young people express moderate to high levels of concern about climate change, and over 45% say these concerns have an adverse impact on relationships, sleep, focus, academic performance, or ability to function at work (Lindhe et al., 2023; Benoit et al., 2025).

Crucially, there is a conceptual difference between generalized anxiety and climate anxiety. While general anxiety does not account for this association, experimental data indicates that anxiety connected to climate change highly predicts climate-related fear. The notion that eco-anxiety is a particular cognitive-emotional response to perceived ecological harm and future uncertainty is supported by this distinction (Von Gal et al., 2024). On the other hand, longitudinal evidence adds complexity. General concerns about climate change among young individuals in the UK did not predict the emergence of mental health illnesses later on. These results suggest that therapeutic significance is determined by severity and functional impact, since they pertain to general worries rather than severe or incapacitating types of climate anxiety (Major-Smith et al., 2025).

Youths are also found to experience climate-related emotional responses that are beyond environmental exposure and are shaped by their exposure to media, guilt, and responsibility. Even though increased awareness and involvement may lead to increased suffering, it also represents their concern and association with the climate crisis, thus emphasizing the need to provide youths with supportive coping mechanisms in addition to mitigation efforts. (Lawrance et al., 2022). These findings imply that moral concern for possible harm and anxiety can be operationalized without environmental exposure. Therefore, worrying about environmental degradation may compound other stresses and increase psychological load in general (Obradovich et al., 2018).

The association between mental health and climate change is further supported by research conducted on children. Increased general stress and depressive and anxiety symptoms are all correlated with elevated climatic distress. In one study, 14% of children met criteria associated with severe depressive illness, whereas roughly 69% of children scored over levels suggestive of GAD. Psychological distress was substantially correlated with higher climate anxiety levels (Soomro et al., 2024).

Recent studies also show that psychological therapies can alleviate climate-related suffering without reducing environmental engagement. While maintaining pro-environmental behaviors, tailored internet-delivered cognitive behavioral treatment (CBT) addressing climate-related discomfort has shown an average decrease in stress, climate-specific anxiety, and depression (Lindhe et al., 2023).

Vulnerability and Resilience

Research consistently demonstrates that women and those with lower incomes are disproportionately more impacted by excessive heat with regard to their mental health. Low-income respondents are about 1.6 times more liable to experience mental health issues on account of temperatures above 30°C than those in the highest-income category. Similarly, women are 1.6 times more likely than males to encounter mental health issues associated with temperature (Obradovich et al., 2018). Another crucial aspect of susceptibility is age. The growth stages of adolescence and early adulthood are particularly delicate. In terms of climate-related stressors, the literature indicates conclusively that mental health problems tend to arise disproportionately through the teenage and young adult years, thereby emphasizing the need for preventive interventions targeting these age groups (Lawrance et al., 2022).

In general, people with limited means are less equipped to protect themselves from environmental stressors by having access to secure housing, cooling infrastructure, or medical treatment. Consequently, the mental impact of climate change builds unevenly throughout society (Obradovich et al., 2018). During heatwaves, those with pre-existing mental illnesses are especially vulnerable because some psychotropic drugs affect thermoregulation, which makes it harder for the body to react to increasing temperatures (Liu et al., 2019; Wong et al., 2024).

Environmental factors greatly increase the risk. High air pollutants, heat islands, and lack of green spaces are associated with increased heat exposure and poor mental health consequences (Zeng et al., 2025; Chukwusa et al., 2025; Lavigne et al., 2023). Apart from individual risk factors, society also plays a major role in identifying the mental health outcome of populations living in climate change situations. Factors such as loss of social roles, discrimination, unstable social networks, and lack of community cohesion are all examples of social vulnerabilities. Factors such as poverty, marginalization, and poor language proficiency are also key socioeconomic risk factors for anxiety and depression in refugees and displaced communities (Goodkind et al., 2020; Hall et al., 2025).

Social displacement in situations where structural inequality is visible often occurs as a result of the displacement caused by climate change. In such cases, the suffering from psychological distress is heightened. According to research, the suffering can be mitigated through the strengthening of social support systems. A study in Pakistan, where the country was flooded and displaced, found that there was less stress, anxiety, and depression in situations where there was more social support (Das et al., 2025). An investigation in Nepal revealed that a mental health and preparedness intervention resulted in more social cohesiveness and preparedness and less depression and PTSD. The mental health benefits were mediated through social cohesion (Welton-Mitchell et al., 2018).

Structural vulnerability describes more general systemic factors that influence exposure and adaptability. The psychological effects of climate extremes are exacerbated by poverty, unstable food systems, insufficient mental health services, poor governance, and inadequate infrastructure. Low- and middle-income rural areas and refugee settlements are prime examples of situations where conflict, institutional instability, and climate hazards combine to create compounded risk (Hall et al., 2025; Das et al., 2025).

Climate change raises healthcare demand while decreasing access to care, according to experts who work with migratory populations in African environments. Mental health issues related to displacement brought on by climate change sometimes go misdiagnosed and untreated. Particular hazards for girls and women include declining sexual, reproductive, and mental health in unsafe environments. These systemic injustices are supported by case studies from Zimbabwe and Sudan (Trummer et al., 2023).

After disasters, individual-level approaches, including impartial awareness and mindfulness,

have been linked to reduced anxiety and depression (Silveira et al., 2021). Adaptation strategies based on nature are also beneficial. Reductions in heat-related mental health hospitalizations have been associated with urban greening projects, especially those that increase tree canopy coverage (Chukwusa et al., 2025; Lavigne et al., 2023). Therefore, environmental design can serve as a public mental health intervention.

Table 01: Resilience Strategies and Interventions for Climate-Related Mental Health

Strategy / Intervention	Description	Target Population	Findings and Outcomes	References
SOLAR Program	Locally delivered, evidence-based psychosocial support	Disaster-affected communities	Significantly decreased PTSD and depression	(Cowlishaw et al., 2023)
Tailored CBT	Online Cognitive Behavioral Therapy for Eco-Distress	Individuals with climate-specific anxiety	Reduced stress without decreasing engagement	(Lindhe et al., 2023)
Livelihood Initiatives	Programs enhancing income and food security	Vulnerable agricultural workers and adults	Increased hope while lowering depressive symptoms	(Hatcher et al., 2020)
Social Connectivity	Multilevel interventions to improve social networks	Displaced populations and refugees	Dramatically decreased anxiety and sadness symptoms	(Goodkind et al., 2020)
Urban Greening	Nature-based designs and tree canopy expansion	Residents in urban heat islands	Lowered heat-related mental health hospitalizations	(Chukwusa et al., 2025)
Hybrid Training	Combined preparedness and mental health support	Communities in disaster-prone regions	Reduced PTSD through enhanced social cohesiveness	(Mitchell et al., 2024; Welton-Mitchell et al., 2018)
Telementoring	Scalable online training for health professionals	Rural and under-resourced clinicians	Improved practitioner confidence and knowledge gains	(Katzman et al., 2022)

Agriculture, trade, and mobility are disrupted by climate-related changes in weather patterns, water availability, and extreme events, which have social, economic, cultural, and political repercussions that increase community vulnerability (Trummer et al., 2023).

Climate change does not always evoke negative emotional reactions. Although eco-anxiety can be upsetting, associated feelings like communal activism and eco-anger may serve as adaptive motivators that promote participation and psychological activity (Stanley et al., 2021; Schwartz et al., 2023). Interventions based on the community help to further enhance resilience. Livelihood initiatives that increase income and food security among Kenyan adults have been shown to increase hope and social engagement while lowering stress and depressive symptoms (Hatcher et al., 2020). In order to simultaneously address structural and psychological vulnerabilities, integrated climate-smart agriculture and mental health models are currently being tried in refugee settlements (Hall et al., 2025).

Effectiveness of community-delivered mental health services is also well-established. After

Australia experienced numerous climate-related calamities, including droughts, wildfires, and pandemic disruptions, the SOLAR program was put in place, and it dramatically decreased anxiety, sadness, and PTSD symptoms. Its success shows that evidence-based interventions provided locally can increase resilience on a large scale (Cowlishaw et al., 2023).

Similarly, rather than stifling valid concerns, group-based therapies for rural children and customized cognitive behavioral therapy for climate-related suffering seek to improve psychological flexibility, meaning-focused adaptation, and coping abilities (Lindhe et al., 2023; Cosh et al., 2025). Strengthening local leadership, climate literacy, and health promotion capacity may indirectly improve mental resilience, according to capacity-building models like train-the-trainer and community health advisor programs in climate-vulnerable areas like the Dominican Republic and coastal Vietnam (Weinstein et al., 2025; Mayfield-Johnson et al., 2020).

Table 02. Climate-related mental health risk factors of vulnerable populations

Population group	Why are they at higher risk?	The climate stressor most affecting them	Region	References
Women	Gender inequality and caregiving burdens increase stress.	Floods, food insecurity, livelihood loss	Zimbabwe and Sudan disaster case studies; Pakistan flood-affected women	Berry et al., 2018; Freihardt, 2025
Low-income communities	Limited resources and adaptive capacity	Extreme heat, housing, and economic instability	Socioeconomic vulnerability analyses in climate-exposed populations	Obradovich et al., 2018; Limaye, 2021
Youth and young adults	Heightened climate anxiety and future uncertainty	Climate change awareness and ecological loss	Global youth climate anxiety surveys	Clayton et al., 2021; Lawrance et al., 2022
Indigenous peoples	Cultural identity tied to ecosystems	Environmental degradation and ecosystem loss	Arctic Indigenous communities experiencing ecological change	Middleton et al., 2020a; Berry et al., 2018
Displaced populations	Forced migration, social network disruption	Flooding, disasters, climate-related displacement	Bangladesh climate displacement contexts	Obradovich et al., 2018; Carías et al., 2022
People with pre-existing mental illness	Medication sensitivity, reduced coping capacity	Heat waves and prolonged extreme temperatures	Heat-related psychiatric hospitalization studies	Obradovich et al., 2018; Limaye, 2021

Cultural interpretation and political environment also influence vulnerability and resilience. The level of concern about climate change varies by nation. Portugal, Austria, and Slovenia evaluate higher levels of climate concern than Sweden or Italy (Collery & Niedzwiedz, 2025). Understanding and managing climate consequences is influenced by cultural frameworks. The collective histories of colonization and displacement are frequently used by Indigenous and refugee populations to analyze environmental change. Although these histories have the potential to exacerbate trauma, they also uphold customs of solidarity and group resistance that fortify resilience (Goodkind et al., 2020; Hall et al., 2025;

Hatcher et al., 2020; Mayfield-Johnson et al., 2020).

Perceptions of inactivity by the government can also affect responses with respect to issues of mental health. This is because, in perceiving inactivity by the government, young people are likely to be betrayed and worried about the effects of climate change (Benoit et al., 2025). Issues regarding climate change are not often raised in professional circles, even though the public is becoming worried about the issue. This is because professionals lack training and are not comfortable discussing the issues in relation to mental health (Bahar et al., 2024).

Evidence Linking Climate Change and Mental Health Outcomes

There is a clear correlation between extreme weather occurrences and poor mental health outcomes. Storms, hurricanes, fires, and floods are some of the natural calamities that cause trauma to people. After a disaster, people experience anxiety, despair, and PTSD (Carías et al., 2022; Scaramutti et al., 2019). Mental distress may be experienced for a long time even when physical damage from a disaster has faded, as revealed by longitudinal studies.

Disaster exposure results in grief and complex bereavement reactions, which lead to prolonged trauma, emotional distress, and augmented hopelessness and anxiety in the individual (Carías et al., 2022; Obradovich et al., 2018). The mental health impacts of disasters can be compounded by repeated exposure to disasters. Environmental disasters disrupt social networks, causing housing loss and economic insecurity, which increase stress and long-term mental health risks (Larasati et al., 2026; Obradovich et al., 2017). As a result, one of the main ways that climate change affects psychological health is through adverse weather events.

Rising temperatures are associated with negative mental health effects, evidenced by studies linking higher ambient temperatures to increased suicide rates and psychiatric distress in the U.S. and Mexico (Burke et al., 2018; Obradovich et al., 2018). These results point to a strong connection between population mental health and climate change.

Heat exposure worsens psychiatric conditions, with analysis of millions of U.S. emergency department visits showing that elevated temperatures lead to increased visits for mood disorders, anxiety disorders, and substance-related issues (Niu et al., 2023; Wang & Fang, 2025). Severe weather leads to mental anguish. Emerging evidence indicates that children and adults may be particularly vulnerable to heat-related mental health risks. Observational studies have demonstrated that higher ambient temperatures are linked to increased hospital admissions for psychiatric disorders among young people (Burke et al., 2018; Niu et al., 2023).

Drought and climate-driven agricultural instability cause psychological stress and economic insecurity in rural communities, leading to increased suicide rates among farmers due to crop failures (Carleton, 2017; Burke et al., 2018). These results demonstrate the close association between rural mental health and environmental shocks (Carleton, 2017; Niu et al., 2023). Over time, environmental uncertainty may create persistent psychological vulnerability.

Climate change drives displacement and migration through extreme weather, sea-level rise, and environmental degradation, disrupting social networks and cultural ties essential for mental well-being (Middleton et al., 2020b; Carías et al., 2022). Anxiety, despair, and trauma-related symptoms are more common in displaced people, according to research. Climate migrants often experience prejudice, economic instability, and future uncertainty (Obradovich et al., 2018; Hickman et al., 2021). During relocation, these pressures make people more psychologically vulnerable. Displacement intensifies mental health issues, leading to grief over lost environment and cultural identity in communities (Middleton et al., 2020b). Long-lasting psychological consequences.

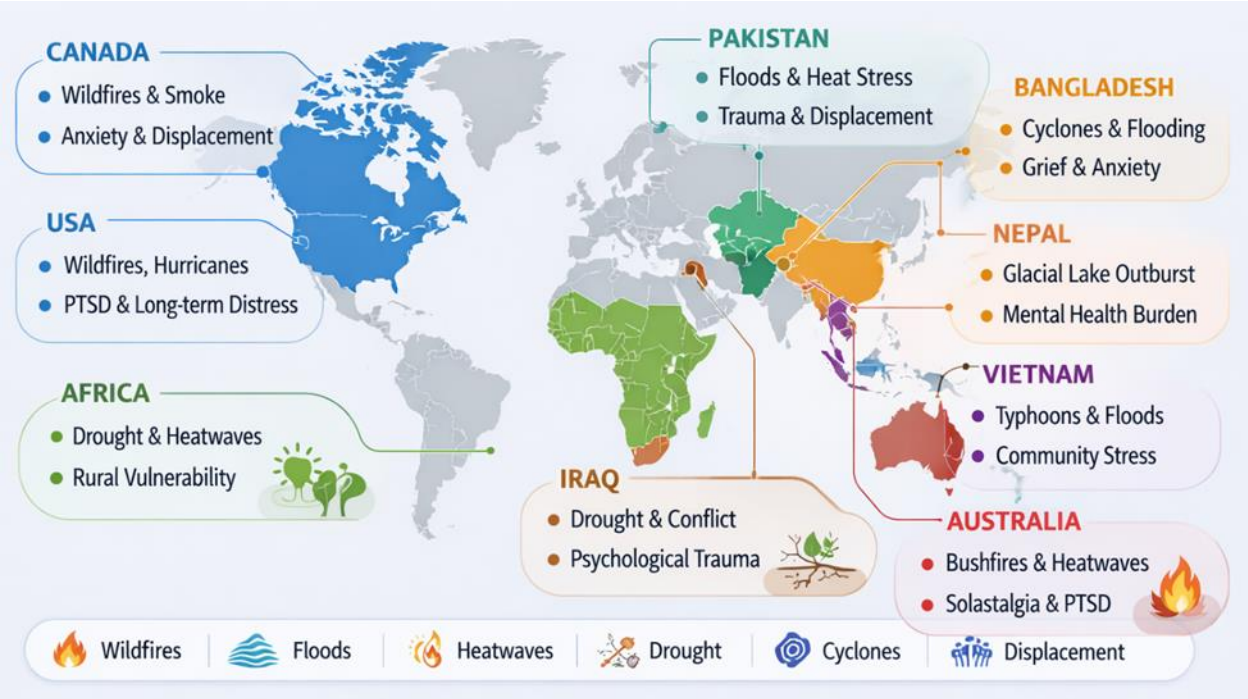

Figure 03: Global evidence on climate change and mental health

Children's and adolescents' mental health can be adversely affected by climate-related stressors, with higher temperatures linked to increased psychiatric hospitalizations (Larasati et al., 2026; Hickman et al., 2021). Through psychological awareness of environmental risks, climate change can potentially have an effect on young people's mental health. Numerous international polls reveal that a large number of youth are deeply concerned about environmental damage and climate change (Clayton et al., 2021; Obradovich et al., 2018). Anxiety and mental discomfort may be exacerbated by these worries. Climate disasters disrupt education and social development, causing school closures and instability, increasing psychosocial stress, and affecting children's mental health long-term (Clayton et al., 2021; Niu et al., 2023).

Indigenous and marginalized populations depend on ecosystems for identity and subsistence, facing severe psychological impacts from environmental degradation. Strong correlations between climate-driven environmental changes and emotional suffering have been found in research conducted among Arctic Indigenous populations (Middleton et al., 2020a; Berry et al., 2018). Loss of hunting grounds disrupts culture and social cohesion. These hazards are exacerbated by socioeconomic deprivation and historical marginalization. Insufficient financial and healthcare resources may make people more susceptible to the negative impacts of climate change on mental health (Middleton et al., 2020b; Clayton et al., 2021). Essential to address disparities for climate-responsive health.

Emerging Concepts in Climate-Related Mental Health

Eco-anxiety describes ongoing distress about climate change, with increasing reports among youth who express feelings of fear, sadness, and anger related to environmental issues (Clayton et al., 2021; Obradovich et al., 2018). Severe ecological distress, while driven by climate concern, can negatively affect psychological well-being, leading to issues such as sleep disturbance, stress, and feelings of helplessness (Clayton et al., 2021; Larasati et al., 2026). These results also demonstrate the rising salience of climate-related emotional responses in the context of mental health research.

Solastalgia is the emotional pain that arises as a result of environmental changes in an individual's home. This brings about grief and feelings of loss, which interfere with the individual's sense of belonging to the land and the community (Larasati et al., 2026). The

affected communities show reduced feelings of belonging and increased emotional pain as a result of ecological changes (Middleton et al., 2020a).

These emotions are associated with political inaction and environmental injustice and result in anger, frustration, and moral distress. Political stress has been found to cause anxiety and emotional exhaustion. However, there are coping strategies in the form of increased agency and group identity in climate activism (Hickman et al., 2021). To understand the emerging mental health problems related to climate imbalance, it is crucial to understand the processes (Obradovich et al., 2018).

Table 03: Climate exposure type and mental health outcomes

Climate exposure	Mental health outcome	Effect size / key finding	Study/Region	References
Heat waves/rising temperatures	Psychological distress and increased suicide risk	Higher temperatures are linked to suicide increases.	United States and Mexico population studies.	Burke et al., 2018; Obradovich et al., 2018
Extreme heat exposure	Psychiatric emergency visits and hospital admissions	Heat associated with increased ER mental visits	United States emergency department analyses	Niu et al., 2023; Wang & Fang, 2025
Floods and severe storms	PTSD, depression, prolonged disaster trauma	Persistent psychological distress after flooding	Pakistan, Iran, Brazil, Australia (Queensland floods)	Carías et al., 2022; Das et al., 2025
Wildfires	Anxiety, depression, climate-related trauma	Long-term symptoms among wildfire survivors	California Camp Fire (USA); Canada wildfire season	Nan et al., 2025; Obuobi-Donkor et al., 2024
Drought and agricultural failure	Farmer stress, depression, and suicide risk	Crop loss associated with higher suicide	Agricultural communities in drought-affected regions	Carleton, 2017; Burke et al., 2018
Climate-related displacement	Anxiety, depression, trauma from displacement	Social disruption increases psychological vulnerability.	Bangladesh displacement; Christchurch relocation (New Zealand)	Middleton et al., 2020b; Carías et al., 2022

The principle methodological challenge is the difficulty in attributing the impact of climate change compared to the effects of other environmental and socio-economic pressures that occur simultaneously (Clayton et al., 2021). In light of these challenges, some scholars have suggested that the outcome of mental health be seen as the result of the interplay of multiple factors rather than the outcome of any individual cause, such as climate change (Epel et al., 2025). Research carried out using larger populations and over longer periods has also indicated the difficulty in attributing the effects of individual factors in this case (Epel et al., 2025). In Vietnam, the increased psychiatric admissions among males were attributed to the effects of alcohol and traffic injuries rather than heat stress, and the increased vulnerability among rural populations was attributed to occupational factors rather than climate change (Trang et al., 2016).

The different types of mental disorders also pose an analysis challenge since they react differently to environmental influences (Liu et al., 2019). However, the factor of concern for climate change and its interplay with social stressors has

its own independent effect on mental health. All the above factors pose a methodological problem in the study of the association between climate change and health (Obradovich et al., 2018). Adverse weather events tend to reduce the risk of suicide in the short term but increase the risk in the long term through thermal stress, psychiatric disorders, and climate change-related distress (Kõlves et al., 2025). Mental health issues can be triggered immediately by exposure to climate change hazards or appear long after the event and persist for a long time (Hayes et al., 2018).

Table 04: Climate-Related Mental Health and Emerging Psychological Constructs

Concept	Definition	Who It Affects Most	Measurement Tools Available	Gap in Research	Outcomes	References
Eco-anxiety	Persistent worry over perceived ecological harm and future uncertainty	Children, adolescents, and young adults	Climate Change Anxiety Scale (CCAS)	Scarcity of longitudinal cohort designs	Predicted fear and functional impairment	(Clayton et al., 2021; Tam et al., 2023)
Solastalgia	Distress from environmental change in one's home environment	Indigenous groups and rural communities	Validated measures currently under development	Lack of standardized cross-country frameworks	Distressed belonging and chronic grief	(Middleton et al., 2020a)
Climate Grief	Mourning lost environments, species, and cultural identity	Displaced people and climate migrants	Emerging grief and loss scales	Limited data on biological mediators	Mourning of culture and identity	(Middleton et al., 2020b; Carías et al., 2022)
Eco-anger	Frustration regarding political inaction and environmental injustice	Youth and environmental activist groups	Group identity and agency assessments	Mechanisms for adaptive motivation are unknown.	Promotes participation and adaptive motivation	(Stanley et al., 2021; Hickman et al., 2021)
Climate Trauma	Persistent psychological and cognitive disaster consequences	Disaster survivors and low-income groups	Neuropsychological and stress-tracking scales	Under-representation of middle-income nations	Cognitive impairment and decision-making deficits	(Nan et al., 2025; Cowlishaw et al., 2023)

The chain from exposure to climate change to psychological damage can include various forms of physical damage, including cattle, farmland, housing, and members of families, all of which can contribute independently to psychological damage. Substance abuse, a secondary damage from displacement-related psychological distress, can be a contributing factor in this regard, demonstrating how exposure to climate change can lead to a chain reaction in different social fields (Hossain et al., 2021). Although these pathways have received more attention in recent years, longitudinal studies on this topic remain scarce (Berry et al., 2018).

However, climate change and mental health studies are limited by inaccurate measurements of exposure, which are hard to confirm in cross-sectional studies, implying that reported results may be lower than the real effect of climate change on human welfare (Obradovich et al.,

2018). Climate health studies use objective data and experiences to measure exposure to climate change, which may be either sudden or continuous. The use of different approaches, such as inaccurate data on exposure and the use of singular variables, results in different findings with low accuracy in climate health studies (Charlson et al. 2022). In a study of two million US residents, it was found that when temperatures rose over 30°C, it caused an increase of over 1% in mental health issues, and when there was heavy rain in any month of the year, it caused another 2%. A 1°C rise in temperatures caused a 2% rise in mental health issues, and when people were exposed to Hurricane Katrina, it caused their mental health issues to increase by 4%. These were particularly high in poor populations and women (Obradovich et al., 2018).

In another study of 608 residents of the Kurdistan region of Iraq, it was found that extreme weather caused PTSD, and climate change-induced homelessness was the biggest predictor of poor mental health in these residents (Kizilhan et al., 2025). Residents of Dhaka and Chattogram cities were found to have high odds of poor mental health, which may be due to their living in cities, which are known to have heat island effects and are socioeconomically disadvantaged. Both gradual increases in temperatures and acute events of flooding increase the risk of poor mental health in climate change populations (Wahid et al., 2023). A study carried out in Mexico on the effects of climate change on the mental health of the youth found that the exposure was linked to a high risk of mental health disorders. The strongest association was found for heatwaves. The effect of floods, hurricanes, droughts, and heatwaves on the mental health of the public was through different pathways. The relationship was mediated by the climate concern, and personal agency provided a protective effect (Pinchoff et al., 2023).

A study conducted in Tanzania found that the framing questions were significant in determining the reported climate distress in the youth. The study found that 46% reported distress when the questions were concrete and 53% when the questions were abstract. In rural Australia, the repeated exposure to natural disasters has resulted in considerable psychological distress in the youth. The distress sometimes exceeded the impacts of the COVID-19 pandemic. Stigma and concerns over confidentiality and services shortages were found to be delays in seeking help. There is a need for face-to-face mental health care provided by local and trusted mental health practitioners who are aware of the local climate change challenges (Klinner et al., 2023). To effectively measure the effect of climate change on psychological well-being, tools are needed that measure not only individual symptoms but also sociocultural aspects such as social capital and cultural relevance (Hayes et al., 2018). Studies validating climate anxiety measurement tools in various cultural settings, such as in Germany, have supported the strong relationship between climate anxiety and mental health outcomes, personality, and lived experiences of climate-related events (Lass-Hennemann et al., 2023).

Mental health is also neglected in climate change adaptation policies in Europe, especially in Southeast Europe and at the municipal level. Vulnerable groups are also neglected in this regard, and the lack of governance and data is also an issue in this regard. The pandemic COVID-19 has also brought the problem of mental health to the foreground, providing an opportunity to develop coordinated adaptation policies in this regard (Hoeben et al., 2023). The first national-level survey with over 12,000 respondents found seven ways that people think about and understand climate change, which include weather patterns, global warming, natural disasters, environmental deterioration, the causes of climate change, distant symbolic indicators, and the solutions to climate change (Yang et al., 2025).

In Iraqi Kurdistan, high climate risk is associated with limited mental health research due to logistics, literacy, internet, and cultural issues (Kizilhan et al., 2025). There is limited climate-health research in developing countries like Nepal despite their high risk of climate disasters. Existing evidence comes from high-income countries, with facility-level preparedness remaining understudied in terms of data, health systems, and emergency preparedness (Khanal et al., 2025). The mental health effects of climate-related events are more prominent among vulnerable populations. For example, low-income women are almost twice as affected as

high-income men, and women are 1.6 times more vulnerable to mental health impacts of climate-related events (Obradovich et al., 2018). For the indigenous population, the mental health effects of climate-related events are substantial and need more research attention, with solastalgia and ecological grief still unquantified (White et al., 2023).

Table 05: Methodological Challenges and Proposed Solutions

Challenges	Description of Limitation	Proposed Solution / Strategy	Findings and Outcomes	References
Attribution Complexity	Difficulty isolating climate impacts from concurrent socio-economic pressures.	Utilize multi-factorial interplay modeling and long-term population studies.	Distinguishes climate from social stressors.	(Clayton et al., 2021; Epel et al., 2025)
Diagnostic Variability	Different ICD-10 categories (F00-F99) react uniquely to environmental influences.	Conduct subcategory-specific analysis and longitudinal tracking.	Resolves varying environmental influence patterns.	(Liu et al., 2019; Berry et al., 2018)
Exposure Measurement	Inaccurate data on sudden vs. continuous climate exposure in cross-sectional studies.	Integrate objective climate data with validated psychometric tools.	Improves accuracy of reported welfare.	(Obradovich et al., 2018; Charlson et al., 2022)
Cultural Relevance	Standardized tools often lack sociocultural capital and local relevance.	Validate instruments (e.g., CCAS) in diverse cultural and lived-experience settings.	Strengthens relationship between lived experiences.	(Hayes et al., 2018; Lass-Hennemann et al., 2023)
Geographic Bias	Scarcity of research in high-risk developing nations compared to high-income countries.	Increase global representation and facility-level preparedness studies.	Closes data gaps in vulnerability.	(Kizilhan et al., 2025; Khanal et al., 2025)
Data Masking	Aggregated data hides rural-specific issues and gendered vulnerabilities.	Separate data presentation and utilize community participation models.	Prevents masking of specific vulnerabilities.	(Yang et al., 2025; Brown et al., 2025)
Workforce Capacity	Limited professional awareness of climate-specific assessment tools and protocols.	Implement competency-based training and scalable telementoring programs.	Boosts practitioner confidence and knowledge.	(Hoppe et al., 2023; Katzman et al., 2022)

In addition, provincial populations are more prone to mental health effects of climate-related events, showing more distress compared to urban populations despite having fewer numbers in unexposed groups. Repeated exposures to disaster events cause psychological degradation for the population, with limited opportunities for recovery contributing to the problem (Li & Leppold, 2025). Out of the US youth, 56.5% experience moderate climate-related distress, and 42.9% experience direct climate impacts, which are associated with eco-anxiety, functional ability, and personal agency. Directly impacted youth are 1.66 times more likely to experience uncertainty in having children, but rural youth are underrepresented, thus requiring mental health interventions (Vercammen et al., 2025). China's rural

residents perceive climate change as local weather due to low educational attainment, but their urban counterparts show greater knowledge of climate change, thus requiring data to be presented separately to avoid masking rural-specific issues (Yang et al., 2025). Only 15% of mental health workers are aware of climate-specific assessment tools, and fewer than one-third feel prepared to handle mental health issues related to climate, thus raising ethical issues due to workforce shortages (Hoppe et al., 2023).

Implications for mental health care systems

Key interventions include climate-resilient care models, climate-specific protocols, telepsychiatry, new training programs, culturally responsive care, and reducing the carbon footprint of psychiatry (Torales et al., 2025). The mental health system needs to address the psychological effect of cumulative climate-related disasters, offering interventions beyond five years for people who have experienced multiple climate-related disasters, offering interventions to at-risk groups, and incorporating mental health into health and disaster planning (Li & Leppold, 2025).

Interventions in schools have been effective in alleviating climate-related distress as a strategy. A 10-week course on coping skills was effective in reducing anxiety and stress with long-term engagement (Epel et al., 2025). The mental health system can address climate change by creating climate-weather-resilient infrastructure, training mental health workers to deal with eco-distress, incorporating climate coping skills into the curriculum, involving youth in climate decisions, and focusing on the most vulnerable groups (Pinchoff et al., 2025).

Chronic exposure promotes emotional exhaustion and risk normalization; however, care-centered approaches like peer support, psychological first aid, and recovery spaces are underutilized (Christia, Setiawan, Van Kempen, & De Jong, 2026). While framing climate change as a public health crisis helps raise awareness of its urgency, its mental health effects are still understudied. Cumulative approaches are needed to fully understand the burden on vulnerable populations, and economic valuation of mental health harms could justify investment in resilience infrastructure, though data gaps currently constrain understanding of inequities and gender differences (Limaye, 2021).

In Bangladesh, Guatemala, and Nigeria, climate-related stressors, including stress, anxiety, depression, and hopelessness, have been documented among youth. Responses should integrate mental health services into climate-resilient systems and engage young people meaningfully in climate action (Pinchoff et al., 2025). In rural, developing nations, climate change contributes to eco-anxiety, trauma, and chronic psychological distress. Research on slow-onset climate effects among women and marginalized communities remains insufficient. Solutions include community-based care, telemedicine, professional training, and climate-resilient health infrastructure (Randenikumara et al., 2025). Heatwave events in Vietnam have been associated with elevated psychiatric hospital admissions, with the elderly at highest risk (RR = 3.2), pointing to the need for acute surge capacity and sustained monitoring of vulnerable populations (Trang et al., 2016).

Mental health remains underrepresented in European climate adaptation planning. Researchers have called for cross-governance integration, locally specific impact data, and capitalizing on post-COVID momentum to elevate mental health preparedness (Hoeben et al., 2023). Most US youth report moderate climate-related distress with functional impairment, highlighting climate mental health as a growing community health concern (Vercammen et al., 2025). Targeted support and cognitive-behavioral approaches to address eco-anxiety while harnessing its strategies are needed to address eco-anxiety, particularly among vulnerable groups (Roldán Merino et al., 2025).

In rural Australia, there is a need for young people impacted by drought to access mental health care services, which should be available in local areas, with teachers and parents receiving training to help detect signs of poor mental well-being, which is also longitudinal in nature, requiring community-based services (Klinner et al., 2023). For women in Nairobi's informal settlements, there is a high prevalence of anxiety and depression associated with natural disasters, but there are also barriers to receiving care. Community participation models, such as engaging women in data collection, show their potential in addressing these issues. The

solution to these issues lies in integrating mental health care, social support networks, and climate adaptation measures (Brown et al., 2025).

Targeted support and cognitive behavioral methods to treat eco-anxiety while using its strategies can be helpful in treating the problem of eco-anxiety, especially in vulnerable populations (Roldán Merino et al., 2025). In rural Australia, youth experiencing drought-related eco-anxiety need mental health services that must be locally available and coordinated, with teachers and parents being the first to notice the problem and needing better training to handle the situation. In both cases, longitudinal surveillance and service delivery methods are required (Klinner et al., 2023).

Women in Nairobi's informal settlements experience increased rates of distress and depression due to adverse meteorological phenomena, and they face many barriers to treatment. Involving women from the local communities as data collectors is evidence that the community participation approach can be beneficial. The solution to the problem lies in the incorporation of mental health services with social support networks and climate change modification approaches (Brown et al., 2025).

In light of the fact that it is projected that 23% of Harris County's population will experience frequent mental health distress in the year 2030, psychological first aid training for the society in the absence of disaster periods is recommended as a way of building community resilience and addressing workforce capacity constraints (Xu et al., 2025). Health professionals need competency-based training in mental health related to climate change, which includes diagnosis, psychological first aid, and managing risks of medications in periods of extreme heat (Seritan, 2025). Mental health training in Zimbabwe, Sierra Leone, and Burkina Faso in the pre-disaster period was critical in the management of mental health in those nations in the aftermath of disaster, as it is far more effective in preparing for disaster than trying to mobilize trained personnel in the aftermath of disaster (Eaton et al., 2022).

An eight-week telementoring course was found to effectively train health professionals on climate-related mental health, using simulated case reports and producing the largest knowledge gains in understanding mental health effects, alongside improved practitioner confidence, demonstrating a scalable training model (Katzman et al., 2022). Farmers and first responders face increased risk of depression and PTSD after climate-related disasters, emphasizing the necessity of greater mental health support and specialized psychiatric training (Perkison et al., 2018). Training programs using simulated case studies have also improved among social workers, counselors, and community health workers across multiple countries (Katzman et al., 2022).

Policy Implications

A growing body of literature demonstrates that climate change is not merely an environmental and physical health problem; it is also intensifying a mental health crisis that needs integrated policy replies. Empirical findings indicate that exposure to extreme weather conditions, heatwaves for a long period, and climate-related displacement is associated with higher rates of post-traumatic stress disorder (PTSD), depression, anxiety, and suicide (Charlson et al., 2021; Cianconi et al., 2020). Nevertheless, mental health considerations are still inadequately reflected.

Findings imply that climate policy frameworks must intentionally integrate psychosocial risk assessment, structured mental health tracking, and trauma-sensitive care within crisis management systems (Berry et al., 2018; Hayes et al., 2018). Impactful collaboration across environmental, health, housing, and social protection sectors is critical, as mental health results are often shaped by socioeconomic instability, displacement, and the erosion of livelihoods (Middleton et al., 2020b). Recent studies highlight the significance of inoculating mental health measures into ecological health susceptibility assessments, enabling progressive modification strategies instead of postponing crisis-driven replies (Charlson et al., 2021).

The emotional outcomes related to climate change impact differently on vulnerable and marginalized groups, particularly low-income populations, native communities, women, children, and those with preexisting mental health issues (Cianconi et al., 2020; Hayes et al., 2018). Systemic inequalities increase vulnerability to environmental risks and

simultaneously restrict access to coping mechanisms and psychological services.

Evidence demonstrates that communities influenced by economic problems and environmental decline report enhanced levels of psychological distress and lessened capacity to adapt (Berry et al., 2018). Consequently, climate justice approaches must address the social factors of mental health, such as protected housing, stable jobs, accessible healthcare, and environmental safeguards.

Just climate policies should coordinate culturally appropriate mental health care and diverse adaptation initiatives to avoid exacerbating mental health disparity (Middleton et al., 2020b). Preventive measures are important to decrease prolonged mental health disorders linked to climate-related stress. Community-focused resilience programs have proven effective in enhancing adaptive coping, social cohesion, and collective capacity after climate-related disasters. (Berry et al., 2018).

Research exhibits that resilience can be built by strengthening social capital and community connections, making available psychological first aid and trauma-informed support to people, and enhancing climate awareness and effective risk communication. Public education initiatives that recognize climate-linked emotional responses, such as eco-anxiety, and encourage adaptive coping strategies can assist in reducing persistent psychological distress (Hayes et al., 2018). Merging preventive mental health initiatives into disaster readiness planning can significantly decrease the psychological effect experienced after disasters (Cianconi et al., 2020).

Table 06: Policy Gaps and Recommendations

Policy Gap / Challenge	Description of Gap	Proposed Recommendation	Findings and Outcomes	References
Inadequate Strategic Integration	Mental health is absent from national plans.	Integrate psychosocial risks into climate policy.	Ensures structured mental health tracking.	(Berry et al., 2018; Hayes et al., 2018)
Siloed Sectoral Governance	Weak coordination between health and environment.	Foster cross-sectoral collaboration and governance.	Critical for managing livelihood erosion.	(Middleton et al., 2020b; Hayes et al., 2018)
Neglect of Vulnerable Groups	Policies ignore marginalized and Indigenous groups.	Prioritize culturally appropriate climate justice care.	Prevents exacerbating existing health disparities.	(Cianconi et al., 2020; Middleton et al., 2020b)
Reactive Disaster Planning	Mental health services remain crisis-driven.	Embed mental health into disaster preparedness.	Decreases psychological effects after disasters.	(Charlson et al., 2021; Cianconi et al., 2020)
Resource & Funding Deficits	Missing funding and specific health indicators.	Designate funds and track health indicators.	Promotes sustainability and health equity.	(Middleton et al., 2020b; Charlson et al., 2021)
Workforce Capacity Gaps	Few professionals were prepared for climate distress.	Implement specialized climate-informed provider training.	Boosts practitioner confidence and knowledge.	(Hoppe et al., 2023; Torales et al., 2025)
Community Capacity Gaps	Peer support and local aid are underutilized.	Strengthen social capital and community resilience.	Enhances adaptive coping and cohesion.	(Berry et al., 2018; Middleton et al., 2020b)

WHO and the United Nations are essential in inserting mental health attention within international climate governance. Studies reinforce the necessity to inoculate mental health into climate conversion plans, disaster risk reduction (DRR) efforts, and the enhancement of health systems. (Charlson et al., 2021).

At the national level, governments can include mental health indicators in climate vulnerability evaluation programs, designate appropriate funds for climate-focused mental health programs, inoculate psychosocial assistance into emergency response frameworks, and promote interdisciplinary research coupling climate science and mental health. Incorporating mental health with all-encompassing climate change strategies helps in holistic adaptation for sustainability and equity. (Middleton et al., 2020b).

Future Directions

While cross-sectional designs have repeatedly found associations between climate-related events, such as heatwaves, floods, and wildfires, and psychological outcomes like psychological distress, depression, anxiety, PTSD, and suicide risk, the mechanisms are still unknown. However, recent systematic and scoping reviews emphasize the need for longitudinal cohort designs to explore temporal relationships, dose-response effects, and mediators such as displacement, economic insecurity, and social fragmentation in climate change and mental health (Charlson et al., 2021; Cianconi et al., 2020).

For example, studies conducted in different nations have shown that as the temperature increases, the rate of suicides is also high; however, long-term studies are essential to distinguish between the effects of climate and related socio-economic and demographic variables (Burke et al., 2018). In addition, studies on the effects of disaster have shown that mental health effects can last for years after the event, thus emphasizing the importance of long-term effects (Berry et al., 2018).

In addition, it is suggested that in the future, more attention should be paid to the design of prospective cohort studies, where cumulative exposures to climate-related events are assessed using a combination of climate modeling and psychiatric epidemiology, with mediators of effects identified at the biological, psychological, and social levels. This will improve causal understanding and inform the development of targeted adaptation responses. While studies on climate-related mental health risks are increasing, few studies have been conducted on interventions. Reviews emphasize the need for climate-focused prevention programs and psychosocial interventions that are generalizable to the wider population (Hayes et al., 2018; Charlson et al., 2021).

Some of the major gaps identified are the need for studies using randomized controlled trials to investigate community-based interventions for building resilience, as well as studies on the effectiveness of psychological first aid in the aftermath of climate-related events and digital tele-mental health interventions for displaced populations as a result of climate-related events. Interventions aimed at building social connections and coping ability have been found to have protective effects in the aftermath of disasters (Berry et al., 2018).

Recently identified constructs such as eco-anxiety, solastalgia, and climate grief require validated measures to be developed, as existing mental health assessment tools are not able to measure chronic and anticipatory climate-related stressors such as climate change (Cianconi et al., 2020). Recently, researchers suggested that standardized measurement tools need to be developed to measure climate-related mental health issues, standardized frameworks for cross-country comparisons need to be developed, and climate exposure need to be added to psychiatric assessments to improve global mental health monitoring and comparisons between studies (Charlson et al., 2021).

However, the application and implementation of scientific evidence in policy and practice have not been uniform. Experts have recommended the development of an integrated approach to climate and mental health governance that links epidemiology with disaster risk reduction and health system planning (Hayes et al., 2018).

Global organizations such as the World Health Organization and the United Nations have begun to recognize the risks to mental health due to climate change as part of the adaptation process in health. Yet, comprehensive

implementation frameworks and dedicated funding mechanisms remain in early stages of development. The research-policy divide can be bridged by including mental health measures in climate change adaptation monitoring systems, developing interdisciplinary research networks in climate change research, psychiatry, and public health, as well as developing climate-informed mental health training programs for healthcare providers. Community involvement is vital in the development of ethically and socially effective climate change and mental health interventions. A number of research studies show that community participation can enhance resilience and improve policy uptake, particularly in indigenous and climate-vulnerable communities (Middleton et al., 2020b).

Some co-production models are designing research with affected communities, using lived experiences in adaptation planning, and using conventional ecological knowledge in building resilience efforts. These strategies enhance adaptive capacity and help mitigate disparities in mental health outcomes (Berry et al., 2018).

Conclusion

The evidence discussed in this paper shows that, in addition to health risks linked to the climate and physical health, mental health is under serious threat as a result of climate change. It is observed that climate change is affecting the psychological disorders in different communities through direct impacts of severe weather events and indirect effects through socioeconomic disruption and anticipatory stress. Depression, anxiety, PTSD, suicide, and substance abuse have all been repeatedly linked to heatwaves, floods, droughts, and wildfires. Additionally, there are psychological responses such as climate worry and ecological-anxiety. Most importantly, it is apparent that the impacts of climate change are distributed unequally, and the risks are significantly higher for poor communities, displaced persons, rural populations, indigenous peoples, women, children and adolescents, and those with a prior mental illness. The psychological effects of exposure to climate change are compounded by structural risks such as hunger, extreme poverty, inadequate infrastructure, and lack of mental health care services. Thus, social and medical inequalities that are currently present are exacerbated in the presence of climate crisis.

Whatsoever, still there are a lot of gaps in this area, despite an enormous growth of study. Longitudinal studies, more comprehensive exposure measurements, as well as more global representation, are badly needed to better understand the long- as well as long-lasting impacts of climate change on the mental health. In consideration of this expanding body of knowledge, practice as well as policy needs to shift. Integration of Mental health in disaster planning, health policy, as well as climate adaptation as well as mitigation planning is necessary. Investing in a strong health infrastructure, creating a social support network, providing clinical education pertinent to climate change, and implementing social psychosocial interventions, are all doable steps that could alleviate the long-lasting effects of climate change.

Ultimately, protecting the psychological health of people during the environmental change period requires concerted efforts of all sectors of society, including the environmental, health, as well as social sectors. In addition to alleviating suffering, enhancing the resilience of people in a more unpredictable climate requires addressing the psychological effects of climate change.

REFERENCES

Amnuaylojaroen, T., & Parasin, N. (2025). A machine learning perspective on the climatic and socioeconomic determinants of mental health in Southeast Asia. *World*, *6*(2), 48.

Bahar, L., Rego, S. A., & Sadeh-Sharvit, S. (2024). Detecting climate anxiety in therapy through natural language processing. *Scientific Reports*, *14*(1), 25976.

Benoit, L., Lowe, R. S., Thomas, I., Amsalem, D., & Martin, A. (2025). Climate change hopefulness, anxiety, and behavioral intentions among adolescents: Randomized controlled trial of a brief "selfie" video intervention. *Child and Adolescent Psychiatry and Mental Health*, *19*(1), 13.

Berry, H. L., Waite, T. D., Dear, K. B. G., Capon, A. G., & Murray, V. (2018). The case for systems thinking about climate change and mental health. *Nature Climate Change, 8*(4), 282–290.

Bethancourt, H. J., Bose, I., Tupou, L. M., Meinhart, M., Frongillo, E. A., Greaves, A., & Young, S. L. (2025). Mental distress and resource insecurity in the Kingdom of Tonga after the 2022 volcanic eruption: Associations of water and food insecurity with mental distress. *Journal of the Academy of Nutrition and Dietetics.*

Brown, H. E., Balakrishnan, A. K., Stamps, K. M., Obara, L. M., Witte, S. S., & Winter, S. C. (2025). Experiences of extreme weather and mental health in climate-vulnerable communities: results from a large-scale survey of women living in informal settlements in Nairobi, Kenya. BMC psychology, 13(1), 1000.

Bryan, K., Ward, S., Roberts, L., White, M. P., Landeg, O., Taylor, T., & McEwen, L. (2020). The health and well-being effects of drought: Assessing multi-stakeholder perspectives through narratives from the UK. *Climatic Change, 163*(4), 2073–2095.

Burke, M., González, F., Baylis, P., Heft-Neal, S., Baysan, C., Basu, S., & Hsiang, S. (2018). Higher temperatures increase suicide rates in the United States and Mexico. *Nature Climate Change, 8*(8), 723–729.

Carías, M. S. E., Johnston, D. W., Knott, R., & Sweeney, R. (2022). Flood disasters and health among the urban poor. *Health Economics, 31*(9), 2072.

Carleton, T. A. (2017). Crop-damaging temperatures increase suicide rates in India. *Proceedings of the National Academy of Sciences, 114*(33), 8746–8751.

Carroll, H., Luzes, M., Freier, L. F., & Bird, M. D. (2020). The migration journey and mental health: Evidence from Venezuelan forced migration. *SSM-Population Health, 10*, 100551.

Casson, N., Cameron, L., Mauro, I., Friesen-Hughes, K., & Rocque, R. (2023). Perceptions of the health impacts of climate change among Canadians. *BMC Public Health, 23*(1), 212.

Charlson, F., Ali, S., Augustinavicius, J., Benmarhnia, T., Birch, S., Clayton, S. ... & Massazza, A. (2022). Global priorities for climate change and mental health research. *Environment International, 158*, 106984.

Charlson, F., Ali, S., Benmarhnia, T., Pearl, M., Massazza, A., Augustinavicius, J., & Scott, J. G. (2021). Climate change and mental health: A scoping review. International Journal of Environmental Research and Public Health, 18(9), 4486.

Christia, M., Setiawan, T., Van Kempen, L., & De Jong, E. (2026). Flood risk perception paradox: balancing awareness and worriedness of Indonesian vulnerable communities in disaster preparedness. Environmental Hazards, 1–23.

Chukwusa, E., Vivaldi, G., Baecker, L., Bowerman, E., Bridge, N., Davidson, N. ... & Bakolis, I. (2025). A longitudinal, population-based, record-linked natural experiment on the effects of extreme heat events on mental health in urban communities: A study protocol. *BMJ Open, 15*(10), e099771.

Cianconi, P., Betrò, S., & Janiri, L. (2020). The impact of climate change on mental health: A systematic descriptive review. *Frontiers in Psychiatry, 11*, 74.

Clayton, S., Manning, C. M., Speiser, M., & Hill, A. N. (2021). *Mental health and our changing climate: Impacts, inequities, responses.* American Psychological Association and ecoAmerica.

Collery, A., & Niedzwiedz, C. L. (2025). Climate change worry and the association with future depression and anxiety: Cross-national analysis of 11 European countries. *BMJ Mental Health, 28*(1).

Cosh, S. M., Bartik, W., Ryan, R., Jefferys, A., Fallander, K., Tully, P. J., & Lykins, A. D. (2025). Maintaining resilience and well-being in the era of climate change: Protocol of an acceptability and feasibility pilot of the Bee Well program for treating eco-anxiety in rural children exposed to natural hazards. *JMIR Research Protocols, 14*(1), e69005.

Costin, A., Fisher, D., Harper, B., Nahhas, R. W., & Sullenbarger, J. (2024). Climate change and mental health: An interactive educational session. *MedEdPORTAL, 20*, 11418.

Cowlishaw, S., Gibson, K., Alexander, S., Howard, A., Agathos, J., Strauven, S. ... & O'Donnell, M. L. (2023). Improving mental health following multiple disasters in Australia: A randomized controlled trial of the Skills for Life Adjustment and Resilience (SOLAR) programme. *European Journal of Psychotraumatology, 14*(2), 2284032.

Daraz, U., Khan, Y., Alsawalqa, R. O., Alrawashdeh, M. N., & Alnajdawi, A. M. (2024). Impact of climate change on women mental health in rural hinterland of Pakistan. *Frontiers in Psychiatry, 15*, 1450943.

Das, J. K., Gaffey, M. F., Ansari, Z. N., Mirani, M., Tabassum, F., Niaz, M. ... & Bhutta, Z. A. (2025). Community-based mental health screening & referral for flood-affected women in rural Pakistan: An intervention feasibility study protocol. *BMJ Open, 15*(10), e104759.

Diefenthaeler, S. M., Cacilhas, A., Hartmann, M. L., Prates-Baldez, D., & Hauck, S. (2025). Assessing mental health during an extreme weather event in southern Brazil. *Trends in Psychiatry and Psychotherapy, 47*, e20240926.

Eaton, J., Nwefoh, E., Duncan, J., Sangare, O., Weekes, Y., & Adams, B. (2022). Addressing mental health and wellbeing in the context of climate change: examples of interventions to inform future practice. Intervention Journal of Mental Health and Psychosocial Support in Conflict Affected Areas, 20(1), 107–113.

Epel, E., Mishra, J., Ekman, E., Ogunseitan, C., Fromer, E., Kho, L. ... & Goldin, P. (2025). Effects of a novel psychosocial climate resilience course on climate distress, self-efficacy, and mental health in young adults. Sustainability, 17(7), 3139.

Freihardt, J. (2025). Environmental shocks and migration among a climate-vulnerable population in Bangladesh. *Population and Environment, 47*(1), 6.

Goodkind, J., Bybee, D., Hess, J., Amer, S., Ndayisenga, M., Greene, N., Choe, R., Isakson, B., Baca, B., & Pannah, M. (2020). Randomized controlled trial of a multilevel intervention to address social determinants of refugee mental health. *American Journal of Community Psychology*.

Hall, J., Ainamani, H. E., Vassiliou, P. T., Döring, S., Gredebäck, G., Peltonen, K. ... & Hecker, T. (2025). Combining mental health and climate-smart agricultural interventions to improve food security in humanitarian settings: Study protocol for the THRIVE cluster-randomized controlled trial with mothers in Nakivale refugee settlement, Uganda. *Trials, 26*(1), 331.

Hamadani, J. D., Hasan, M. I., Baldi, A. J., Hossain, S. J., Shiraji, S., Bhuiyan, M. S. A., ... & Pasricha, S. R. (2020). Immediate impact of stay-at-home orders to control COVID-19 transmission on socioeconomic conditions, food insecurity, mental health, and intimate partner violence in Bangladeshi women and their families: An interrupted time series. *The Lancet Global Health, 8*(11), e1380–e1389.

Hatcher, A. M., Lemus Hufstedler, E., Doria, K., Dworkin, S. L., Weke, E., Conroy, A. ... & Weiser, S. D. (2020). Mechanisms and perceived mental health changes after a livelihood intervention for HIV-positive Kenyans: Longitudinal, qualitative findings. *Transcultural Psychiatry, 57*(1), 124–139.

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*, 28.

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E. ... & Van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. *The Lancet Planetary Health, 5*(12), e863–e873.

Hoang, T., Noy, I., & Van, T. L. (2025). Heterogenous mental health impacts of a forced relocation: The red zone in Christchurch (New Zealand). *Health Economics, 34*(10), 1782–1803.

Hoeben, A. D., et al. (2023). Integrating public health in European climate change adaptation policy and planning. Climate Policy, 23(5), 609–622.

Hoppe, B. O., Prussia, L., Manning, C., Raab, K. K., & Jones-Casey, K. V. (2023). 'It's Hard to Give Hope Sometimes': Climate Change, Mental Health, and the Challenges for Mental Health Professionals. Ecopsychology, 15(1), 13–25.

Hossain, A., et al. (2021). Effects of riverbank erosion on mental health of the affected people in Bangladesh. PLoS ONE, 16(7), e0254782.

Hua, Y., Qiu, Y., & Tan, X. (2023). The effects of temperature on mental health: Evidence from China. *Journal of Population Economics, 36*(3), 1293–1332.

Kaiser, Z. A. (2023). Analysis of the livelihood and health of internally displaced persons due to riverbank erosion in Bangladesh. *Journal of Migration and Health, 7*, 100157.

Katzman, J. G., Tomedi, L. E., Herring, D., Jones, H., Groves, R., Norsworthy, K. ... & Arora, S. (2022). Educating community health professionals about the health-related effects of climate change through ECHO telementoring. Journal of Primary Care & Community Health, 13, 21501319221102033.

Khanal, S., Schubert, T., Boeckmann, M., & Pradella, F. (2025). Assessing health facility preparedness in Nepal for addressing climate-related disasters and climate-sensitive diseases. *Frontiers in Climate, 7*, 1625829.

Kizilhan, J. I., Al-Ghurbani, S., Uricher, J., Ag, Z., Musa, I. K., & Isa, B. S. (2025). Exposure to climate-related stressors undermines mental health in the Kurdistan Region of Iraq: a cross-sectional study. Frontiers in Public Health, 13, 1719584.

Klinner, C., Glozier, N., Yeung, M., Conn, K., & Milton, A. (2023). A qualitative exploration of young people's mental health needs in rural and regional Australia: engagement, empowerment and integration. BMC psychiatry, 23(1), 745.

Kõlves, K., Shaw-Williams, D., Krishnamoorthy, S., Bayliss, L., Hawgood, J., & Reifels, L. (2025). From rising temperature to eco-emotions: exploring the impact of climate change on suicidality. The Lancet Regional Health—Western Pacific, 55.

Kotcher, J., Maibach, E., Miller, J., Campbell, E., Alqodmani, L., Maiero, M., & Wyns, A. (2021). Views of health professionals on climate change and health: A multinational survey study. *The Lancet Planetary Health, 5*(5), e316–e323.

Larasati, A., Achilleos, S., Tymvios, F., Chrysanthou, A., Koutrakis, P., Alahmad, B., & Quattrocchi, A. (2026). Ambient temperature and mental health hospital admissions in Cyprus during 2000–2019. *Environmental Research: Health, 4*(1), 015004.

Lass-Hennemann, J., Dietrich, J., Lammers, F., & Schote, A. B. (2023). Climate anxiety in a German population sample: validation of the German version of the climate anxiety scale and associations with mental health, personality, and personal experience of climate change. *BMC Psychology, 11*(1), 192.

Lau, S. S., Appiah, K., Ho, C. C., Cheng, M. C., & Yang, B. Y. (2025). Measuring Chinese negative emotion towards climate change: Psychometric properties of the Chinese version of Climate Change Anxiety Scale. *The Journal of Climate Change and Health, 21*, 100364.

Lavigne, E., Maltby, A., Côté, J. N., Weinberger, K. R., Hebbern, C., Vicedo-Cabrera, A. M., & Wilk, P. (2023). The effect modification of extreme temperatures on mental and behavior disorders by environmental factors and individual-level characteristics in Canada. *Environmental Research, 219*, 114999.

Lawrance, E. L., Jennings, N., Kioupi, V., Thompson, R., Diffey, J., & Vercammen, A. (2022). Psychological responses, mental health, and sense of agency for the dual challenges of climate change and the COVID-19 pandemic in young people in the UK: An online survey study. *The Lancet Planetary Health, 6*(9), e726–e738.

Li, A., & Leppold, C. (2025). Long-term mental health trajectories across multiple exposures to climate disasters in Australia: a population-based cohort study. The Lancet Public Health, 10(5), e391–e400.

Limaye, V. S. (2021). Making the climate crisis personal through a focus on human health. *Climatic Change, 166*(3), 43.

Lindhe, N., Bengtsson, A., Byggeth, E., Engström, J., Lundin, M., Ludvigsson, M. ... & Andersson, G. (2023). Tailored internet-delivered cognitive behavioral therapy for individuals experiencing psychological distress associated with climate change: A pilot randomized controlled trial. *Behaviour Research and Therapy, 171*, 104438.

Liu, X., Liu, H., Fan, H., Liu, Y., & Ding, G. (2019). Influence of heat waves on daily hospital visits for mental illness in Jinan, China—a case-crossover study. *International Journal of Environmental Research and Public Health, 16*(1), 87.

Luong, T. T., Handley, T., Austin, E. K., Kiem, A. S., Rich, J. L., & Kelly, B. (2021). New insights into the relationship between drought and mental health emerging from the Australian rural mental health study. *Frontiers in Psychiatry, 12*, 719786.

Major-Smith, D., Halstead, I., & Major-Smith, K. (2025). Does concern regarding climate change impact subsequent mental health? A longitudinal analysis using data from the Avon Longitudinal Study of Parents and Children (ALSPAC). *Royal Society Open Science, 12*(8).

Mayfield-Johnson, S., Fastring, D., Le, D., & Nguyen, J. (2020). Addressing the social vulnerability of Mississippi Gulf Coast Vietnamese community through the development of community health advisors. *Sustainability, 12*(9), 3892.

Miller, J. D., Frongillo, E. A., Weke, E., Burger, R., Wekesa, P., Sheira, L. A., ... & Young, S. L. (2021). Household water and food insecurity are positively associated with poor mental and physical health among adults living with HIV in Western Kenya. *The Journal of Nutrition, 151*(6), 1656–1664.

Mitchell, A., Maheen, H., & Bowen, K. (2024). Mental health impacts from repeated climate disasters: An Australian longitudinal analysis. *The Lancet Regional Health–Western Pacific, 47*.

Nan, J., Jaiswal, S., Ramanathan, D., Withers, M. C., & Mishra, J. (2025). Climate trauma from wildfire exposure impacts cognitive decision-making. *Scientific Reports, 15*(1), 11992.

Niu, L., Girma, B., Liu, B., Schinasi, L. H., Clougherty, J. E., & Sheffield, P. (2023). Temperature and mental health–related emergency department and hospital encounters among children, adolescents and young adults. *Epidemiology and Psychiatric Sciences, 32*, e22.

Nori-Sarma, A., Sun, S., Sun, Y., Spangler, K. R., Oblath, R., Galea, S. ... & Wellenius, G. A. (2022). Association between ambient heat and risk of emergency department visits for mental health among US adults, 2010 to 2019. *JAMA Psychiatry, 79*(4), 341–349.

Obradovich, N., Migliorini, R., Mednick, S. C., & Fowler, J. H. (2017). Nighttime temperature and human sleep loss in a changing climate. *Science Advances, 3*(5), e1601555.

Obradovich, N., Migliorini, R., Paulus, M. P., & Rahwan, I. (2018). Empirical evidence of mental health risks posed by climate change. *Proceedings of the National Academy of Sciences, 115*(43), 10953–10958.

Obuobi-Donkor, G., Shalaby, R., Agyapong, B., Dias, R. D. L., Eboreime, E., Wozney, L., & Agyapong, V. I. O. (2024). Evaluating the 3-month post-intervention impact of a supportive text message program on mental health outcomes during the 2023 wildfires in Alberta and Nova Scotia, Canada. *Frontiers in Public Health, 12*, 1452872.

Pardon, M. K., Dimmock, J., Chande, R., Kondracki, A., Reddick, B., Davis, A. ... & Barkin, J. L. (2024). Mental health impacts of climate change and extreme weather events on mothers. *European Journal of Psychotraumatology*, *15*(1), 2296818.

Perkison, W. B., Kearney, G. D., Saberi, P., Guidotti, T., McCarthy, R., Cook-Shimanek, M. ... & Nabeel, I. (2018). Responsibilities of the occupational and environmental medicine provider in the treatment and prevention of climate change-related health problems. Journal of occupational and environmental medicine, 60(2), e76–e81.

Pinchoff, J., Etetim, E. O., Babatunde, D., Blomstrom, E., Ainul, S., Akomolafe, T. O. ... & Austrian, K. (2025). How climate change is shaping young people's health: a participatory, youth co-led study from Bangladesh, Guatemala and Nigeria. *BMJ global health*, *10*(1).

Pinchoff, J., Regules, R., Gomez-Ugarte, A. C., Abularrage, T. F., & Bojorquez-Chapela, I. (2023). Coping with climate change: The role of climate related stressors in affecting the mental health of young people in Mexico. PLOS global public health, 3(9), e0002219.

Randenikumara, S., Khan, E. A., Ndlovu-Tenego, M., Korzh, O., Nedungalaparambil, N. M., Haval, S. ... & Kumar, P. (2025). Climate Change, Urbanization, and the Future of Rural Health: Addressing Challenges and Opportunities. Journal of Surgical Specialties and Rural Practice, 6(1), 19–24.

Roldán Merino, J., Moreno Poyato, A., Malleville, M. E., Botero, C., Arredondo, A. Y., Rodriguez Quiroga, A. ... & Sampaio, F. (2025). Examining the relationships between eco-anxiety, sociodemographic factors, experience of climate events, pro-environmental behaviours, and life satisfaction in young adults. BMC psychology, 13(1), 998.

Scaramutti, C., Salas-Wright, C. P., Vos, S. R., & Schwartz, S. J. (2019). The mental health impact of Hurricane Maria on adults in Puerto Rico: Evidence from an extremely affected high-poverty tropical region. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, *40*(2), 120–125.

Schwartz, S. E., Benoit, L., Clayton, S., Parnes, M. F., Swenson, L., & Lowe, S. R. (2023). Climate change anxiety and mental health: Environmental activism as buffer. *Current Psychology*, *42*(20), 16708–16721.

Seritan, A. L. (2025). Competency-based climate change and mental health education: an emerging paradigm. Academic Psychiatry, 49(1), 89–93.

Shabani, A., Rasoulian, M., Naserbakht, M., Hakim Shooshtari, M., Hajebi, A., Tiyuri, A., & Motevalian, S. A. (2024). Prevalence and determinants of post-traumatic stress disorder five months after the 2019 huge flooding in Iran. *BMC Public Health*, *24*(1), 346.

Silveira, S., Kornbluh, M., Withers, M. C., Grennan, G., Ramanathan, V., & Mishra, J. (2021). Chronic mental health sequelae of climate change extremes: A case study of the deadliest Californian wildfire. *International Journal of Environmental Research and Public Health*, *18*(4), 1487.

Soomro, S., Zhou, D., & Charan, I. A. (2024). The effects of climate change on mental health and psychological well-being: Impacts and priority actions. *Cambridge Prisms: Global Mental Health*, *11*, e118.

Stanley, S. K., Hogg, T. L., Leviston, Z., & Walker, I. (2021). From anger to action: Differential impacts of eco-anxiety, eco-depression, and eco-anger on climate action and wellbeing. *The Journal of Climate Change and Health*, *1*, 100003.

Sugg, M. M., Runkle, J. D., Hajnos, S. N., Green, S., & Michael, K. D. (2022). Understanding the concurrent risk of mental health and dangerous wildfire events in the COVID-19 pandemic. *Science of the Total Environment*, *806*, 150391.

Tahernejad, A., Sohrabizadeh, S., Mehrabi, Y., & Mashhadi, A. (2025). Investigating the conceptual model of the formation of psychological resilience in farmers affected by droughts in Iran using structural equation modeling. *BMC Public Health, 25*(1), 1883.

Tam, K. P., Chan, H. W., & Clayton, S. (2023). Climate change anxiety in China, India, Japan, and the United States. *Journal of Environmental Psychology, 87*, 101991.

Tao, J., Yu, H., Hu, J., Wang, X., Cai, R., Jin, S. ... & Cheng, J. (2025). Temporal variation in the association between heatwave and mortality from mental disorders: Population-based evidence from a megacity of China. *Journal of Global Health, 15*, 04231.

Torales, J., Torres-Romero, A. D., O'Higgins, M., Ventriglio, A., Castaldelli-Maia, J. M., Caycho-Rodríguez, T. ... & Barrios, I. (2025). Climate change and the future of psychiatry: challenges and opportunities for the next three decades. International Review of Psychiatry, 1–10.

Trang, P. M., et al. (2016). Heatwaves and hospital admissions for mental disorders in northern Vietnam. PLoS ONE, 11(5), e0155609.

Trummer, U., Ali, T., Mosca, D., Mukuruva, B., Mwenyango, H., & Novak-Zezula, S. (2023). Climate change aggravating migration and health issues in the African context: The views and direct experiences of a community of interest in the field. *Journal of Migration and Health, 7*, 100151.

Vercammen, A., Wray, B., Crider, Y. S., Belkin, G., & Lawrance, E. L. (2025). Psychological impacts of climate change on US youth. Proceedings of the National Academy of Sciences, 122(16), e2311400122.

Von Gal, A., Fabiani, G., & Piccardi, L. (2024). Climate change anxiety, fear, and intention to act. *Frontiers in Psychology, 15*, 1341921.

Wahid, S. S., Raza, W. A., Mahmud, I., & Kohrt, B. A. (2023). Climate-related shocks and other stressors associated with depression and anxiety in Bangladesh: a nationally representative panel study. The lancet planetary health, 7(2), e137–e146.

Wang, H., & Fang, T. (2025). Cumulative heat exposure and mental health in older Chinese adults with social isolation mediation. Scientific Reports, 15(1), 43470.

Weinstein, H. N., Hadley, K., Patel, J., Silliman, S., Gomez Carrasco, R. Y., Arredondo Santana, A. J., ... & Valenzuela González, A. C. (2025). A train-the-trainer approach to build community resilience to the health impacts of climate change in the Dominican Republic. *International Journal of Environmental Research and Public Health, 22*(4), 650.

Welton-Mitchell, C., James, L. E., Khanal, S. N., & James, A. S. (2018). An integrated approach to mental health and disaster preparedness: A cluster comparison with earthquake-affected communities in Nepal. *BMC Psychiatry, 18*(1), 296.

Wertis, L., Runkle, J. D., Sugg, M. M., & Singh, D. (2023). Examining Hurricane Ida's impact on mental health: Results from a quasi-experimental analysis. *GeoHealth, 7*(2), e2022GH000707.

White, B. P., Breakey, S., Brown, M. J., Smith, J. R., Tarbet, A., Nicholas, P. K., & Ros, A. M. V. (2023). Mental health impacts of climate change among vulnerable populations globally: an integrative review. Annals of global health, 89(1), 66.

Wong, A. Y., Iwagami, M., Taniguchi, Y., Kawamura, C., Suzuki, A., Douglas, I. J. ... & Tamiya, N. (2024). The role of psychotropics on the associations between extreme temperature and heat-related outcomes among people with mental health conditions: Population-based study. *Psychological Medicine, 54*(16), 4658–4664.

Xu, L., Adepoju, O. E., Tipton, M. E., & Rifai, H. (2025). Intersecting risks: A longitudinal analysis of climate exposure, social vulnerability, and mental health in the Texas Gulf Coast. Frontiers in Public Health, 13, 1701671.

Yang, J., He, W., Xia, Z., Wu, K., Fang, W., Ma, Z. ... & Bi, J. (2025). Measuring climate change perception in China using mental images: A nationwide open-ended survey. *Risk Analysis*, *45*(2), 441–456.

Zeng, R., Zhao, J., Hu, Y., Chu, L., Du, S., Zheng, C., & He, C. (2025). Spatial correlations between summer ozone heatwave dual events and residents' mental health in China. *Scientific Reports*, *15*(1), 21268.